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IMPROVED CALORIC ENGINE.

The Caloric Engine and Siren Fog Signals Company, of London, have been occupied in producing caloric engines suitable for general purposes, and our illustration, which we find in *Engineering*, shows the most recent design. This engine is of two horse power nominal, or 3½ actual horse power.

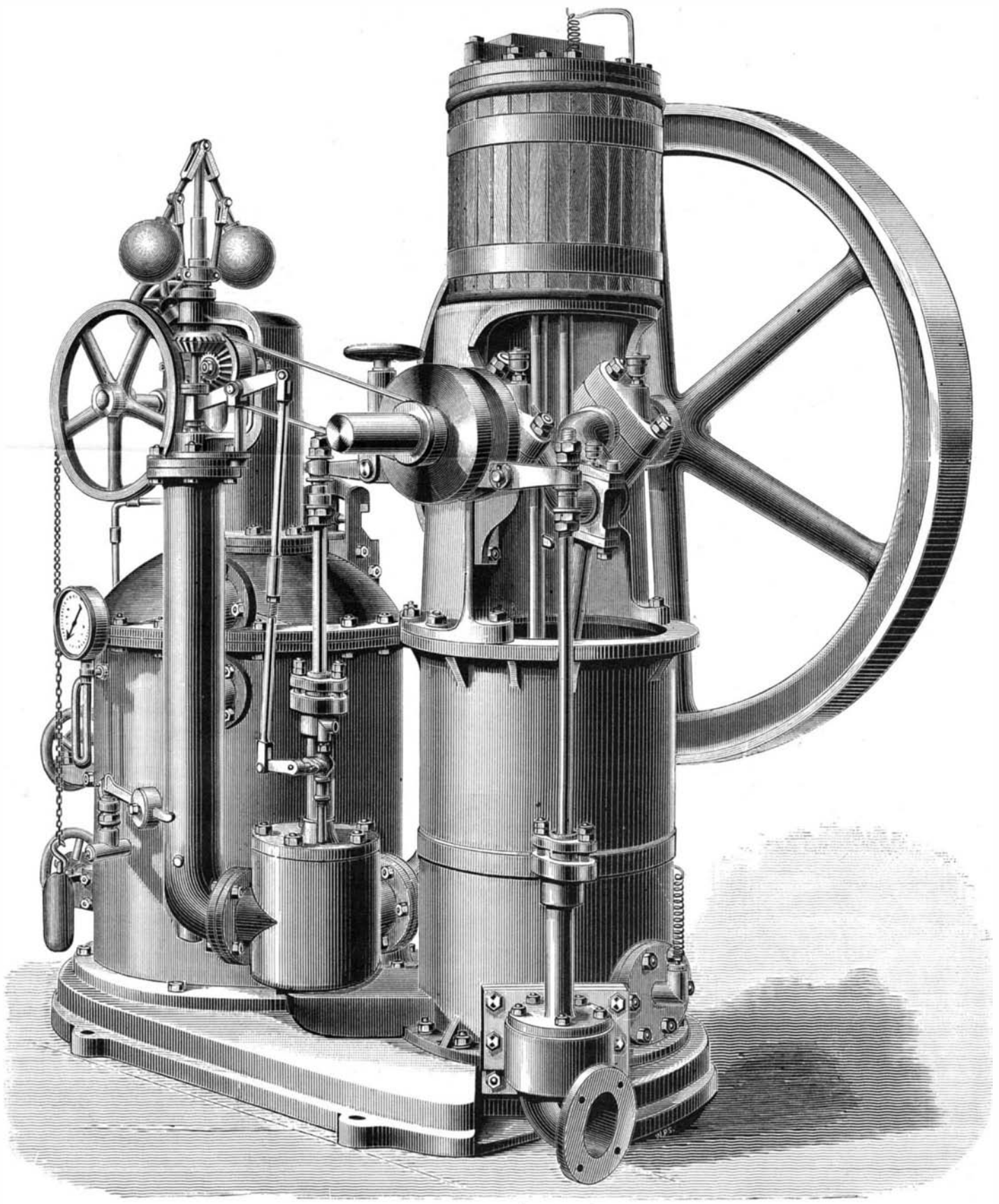
It consists essentially of three parts, viz., a pump for supplying compressed atmospheric air; a generator or retort into which the air is forced and there heated; and a cylinder into which the heated air is expanded for the purpose of operating the piston. The generator comprises a cylindrical firebrick lining of smaller diameter than the casing, so that an annular space is left between the two, and a set of grate bars upon which the fuel is burned.

After a fire has been lighted in the generator, the air is, in the first instance, supplied by a hand pump or (in the case of small engines) by turning the fly wheel until the necessary pressure is created, when the engine commences to work, and the air pump at the top delivers at each upstroke of the piston a charge of air into a valve casing, where, by means of a hollow cylindrical valve, it is divided into two streams one entering into the annular space above referred to, whence it descends and passes through the grate bars and the fuel, the other stream being delivered directly into the spaces above the fire. The air passing through the incandescent fuel forms, in the first instance, carbonic acid and ultimately carbonic oxide, so that the space above the fire may be considered as a combustion chamber, containing carbonic oxide and nitrogen. The oxygen of the air delivered into this space enters into immediate combination with the carbonic oxide, and produces an intense heat with a consequent increase of pressure.

The governor alters the position of the cylindrical valve according to the load on the engine, so that the proportion of air sent through the fire and into the space above is varied, and also the consumption of fuel, according to the amount of work being done by the engine.

In engines of larger size than the one we illustrate the governor is made to perform four functions, viz.: 1, it determines what quanty of air is to be delivered to the bottom of the fire; 2, what quantity above fire; 3, what quantity of air is to be rejected altogether; and 4, at what point of the piston's stroke the supply of motive fluid is to be "cut off." One great impediment to the successful operation of a caloric engine, working at such a high temperature, has been the undue heating of the connections and seating of the valve, which commands the communication between the generator and the working cylinder. This difficulty is now overcome by surrounding the parts with an air chamber, which forms practically a part of the main pipe for conveying the compressed air from the pump to the generator; so that for every stroke of the pump there is a current of cold air around the valve. The piston, which, as is usual in caloric engines, is provided with a shield or guard, has rings of the Ramsbottom kind, which are found to answer well.

The illustration shows a single cylinder engine, which is very satisfactory for ordinary purposes, but where great regularity and steadiness of working is essential, these engines are constructed with two cylinders, the cranks being



IMPROVED CALORIC ENGINE.

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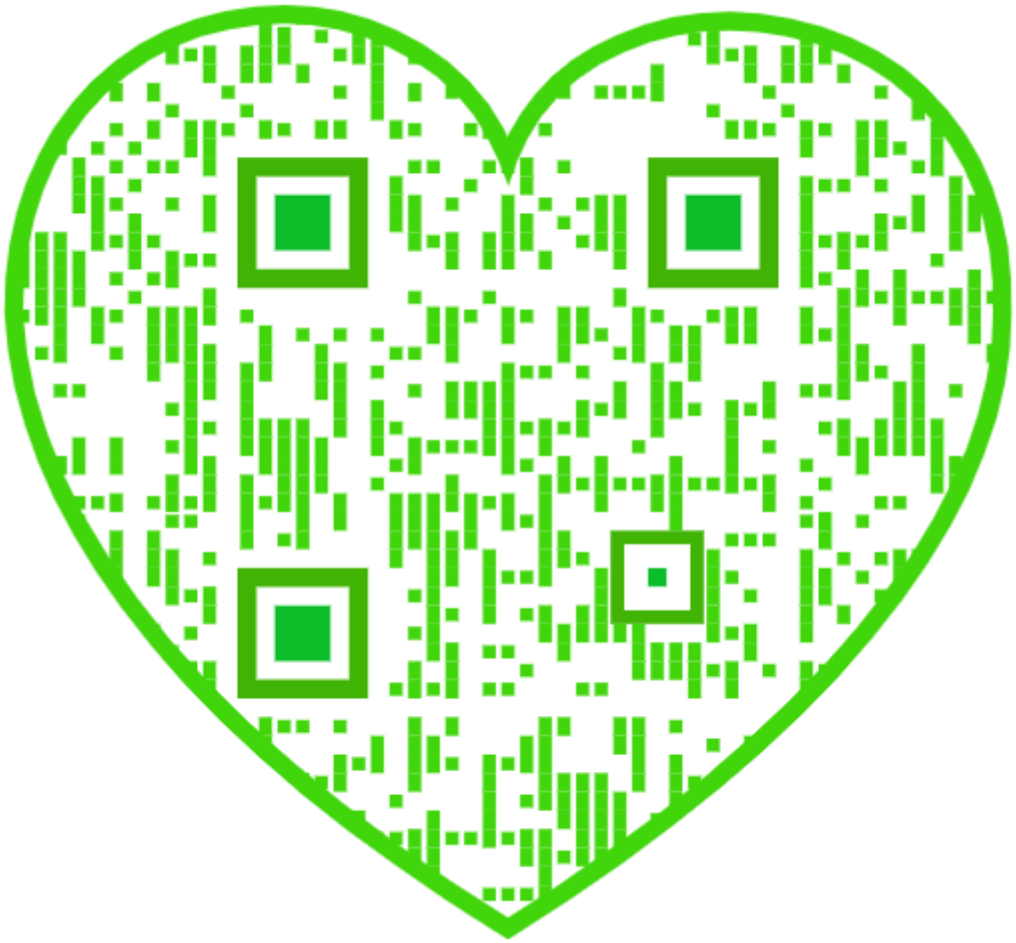

placed at right angles. From a test made with a twelve horse power double cylinder caloric engine the following results are stated to have been obtained: Indicated horse power of cylinders, 41·24; power of air pumps, 21·04; net indicated horse power, 20·2. Tested by the dynamometer the effective horse power was 14·39. The consumption of ordinary gas coke was 36·56 pounds per hour, which equals 1·8 pounds per indicated horse power, and 2·54 pounds per effective horse power. The difference between the indicated and effective power shows a considerable margin for friction, but it must be remembered that the cylinders are necessarily larger than those of a steam engine of same power.

THE REBACKING OF PAINTINGS.

A Washington letter describes the *modus operandi* of taking off the old canvas of some of the great paintings hanging in the Capitol rotunda and substituting new. The picture is laid upon its back on the floor and a sufficient thickness of cartridge paper gummed on the face to prevent injury. It is then turned over and the old canvas scoured off with pumice stone. This is a tedious operation requiring much care. The new canvas is stretched and covered with a thick adhesive substance which penetrates every part. The back of the painting is then covered with a more fluid mixture, when the canvas is laid upon it. The whole is turned over, the face of the picture coming uppermost. Small flat-irons, heated to a temperature that will hasten the drying of the glues without injuring the paint, are passed carefully over the surface, the cartridge paper preventing harm. Toward the close heavier irons are used. The paper is then moistened and removed, when, after imperfections have been touched up, the picture is returned to the wall.

"MIND YOUR BUSINESS."

An anecdote is told of a clockmaker who, being employed to construct a new clock for the Temple, London, was desirous of a suitable motto to be placed under the clock. One day he applied to the benchers of the Temple for the motto, while they were at dinner, and one of them, annoyed at the unseasonable interruption, testily replied, "Go about your business." Understanding this to be the selected motto, the clockmaker inscribed it under the clock, where it still remains to admonish all to attend to business.

The Continental cent, usually known as the Franklin cent because its legend was proposed by him, gives the same advice in the words: "Mind your business." This is frequently misquoted and corrupted to "Mind your own business," which instead of a counsel to diligence is a rebuke to meddling. Franklin's advice was an admonition to perform duty and to care for the concerns which make life successful. It contains the very kernel of all business wisdom. A homely adage is that "It is better to drive your business than to let your business drive you," better to be a master and manager of your business than to be its slave and victim. This is the essence of the Franklin cent motto, and, whether acknowledged in so many words or not, it is the actuating principle and the underlying cause of all business management and business success.

A Historical Case of Acquired Automatism.

The venerable pianist, Franz Liszt, says the *Times*, has ceased to play in public on account of the stiffness of his finger-joints. The fact recalls the method by which he used to keep his fingers supple, a method which is also an interesting illustration of acquired automatism. It was his custom for more than forty years to read a mass immediately upon rising in the morning, and when that duty was finished to seat himself at the piano. So seated, he placed on the rack in front of him, not a musical composition, but some new work of French or German literature, first being careful to mark the number of pages which he intended to read. Then for a long time, sometimes for two or three hours, he would continue to read his book and practice scales. On one occasion, being asked if the reading did not interfere with the playing, or the playing with the reading, he replied: "Oh, no, the playing of the scales is entirely mechanical with me, and simply exercises the fingers; I give all my mind to the reading, very much as do our good ladies who knit stockings and read at the same time."

An Elastic Lacquer.

A lacquer, said to be of great elasticity, perfectly supple and not liable to peel off, is made in the following manner: About 120 pounds of oil varnish is heated in one vessel, and 33 pounds of quicklime is put into 22 pounds of water in another. As soon as the lime causes an effervescence, 55 pounds of melted India-rubber are added. This mixture is stirred and then poured into the vessel of hot varnish. The whole is then stirred so as to be thoroughly mixed, then strained and allowed to cool, when it has the appearance of lead. When required for use, it is thinned with the necessary quantity of varnish and applied with a brush, hot or cold, preferably the former. This lacquer is useful for wood or iron and for walls; it will also render waterproof cloth paper, etc.

THE United States Wood Vulcanizing Company of this city have had sixty of Jenkins' valves in use during the last year, some under steam pressure of 150 to 235 pounds per square inch, others under 150 pounds air pressure. The sizes vary from 4 inch downward, and we are informed that the cost for repairs for the sixty valves has been less than three dollars.

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Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural inventions..... 378
Aluminum coated iron..... 371
American Astronomical Society. 369
Bag holder, improved*..... 377
Barb fence patents overthrown.. 368
Basic process, the..... 373
Beetle, the elm leaf..... 373
Blanchard's quadricycle*..... 374
Calf weaner*..... 377
Caloric engine, improved*..... 367
Carbonic gas and water mixer*.. 371
Cascade saturator, the*..... 371
Cause of boiler explosions, a.... 374
Chimney flues and fireplaces.... 373
Colored varnishes for tin..... 374
Columbia tricycle, the*..... 370
Combined heater and oven*..... 377
Decisions relating to patents... 373
Elastic lacquer..... 368
Elec. conductors, protector for*. 377
Electrical railway signaling*..... 376
Emery wheel, new*..... 377
Engineering inventions 378
Ensilage..... 371
Explosion of ozone..... 375
Farm hand carts*..... 376
Fireproof passenger cars..... 372
Food for man, insects as..... 375
Fool's gold..... 376
French physical laboratories.... 369
Friction wheels..... 370
Giant locust, the*..... 375
Gossamer rubber goods, manuf.. 372
Harrow, improved*..... 377
Heater and oven combined*..... 377
Historical acquired automatism. 368
Houses and homes in New York. 376
Impervious cloth..... 370
Improved bag holder*..... 377
Induced current, the..... 368
Insects as food for man..... 375
Inventions, miscellaneous..... 378
Iron magnetized by breaking.... 377
Labor and food..... 373
Lamp reflector*..... 377
Locust, the giant*..... 375
Malaria, spread of..... 373
Making the deaf to hear*..... 373
Meat safe, portable*..... 371
Mechanical inventions..... 378
Mechanics' apprentices..... 370
"Mind your business"..... 368
Paintings, rebacking of..... 368
Perpetual motion machine..... 377
Pipe wrench, improved*..... 377
Pneumatic transm. of power.... 372
Portable meat safe*..... 371
Pressure gauge test, appar*..... 374
Quadricycle for land and water*. 374
Ramie, carding and bleaching... 376
Rebacking paintings..... 368
Reflector for lamps*..... 377
Roofing linen..... 370
Round noses *v.* diamond shape.. 369
Salmon trade of Oregon..... 372
Storms and water traps*..... 371
Shirt studs, shield for*..... 377
Shutter and blind operator*.... 377
Sleep, hints on..... 377
Tanned fabrics..... 370
Test for boric acid..... 371
Testing appar. pressure gauge*.. 374
Time by telegraph..... 374
Trays, improvements in*..... 377
Tricycle, the Columbia*..... 370
Varnishes for tin, colored..... 374

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 389,

For the Week ending June 16, 1883.

Price 10 cents. For sale by all newsdealers

PAGE

I. ARCHITECTURE AND DECORATIVE ART.—Chippendale Furniture.—Several figures..... 6199
Rectory near Reading.—1 illustration..... 6200
The Fireproof Towns of the River Plate..... 6200

II. ENGINEERING.—Progress of the Panama Canal..... 6200
Vibrations in Bridges, etc.—1 figure..... 6201
The Monongahela Suspension Bridge at Pittsburgh, Pa.—By Col. S. M. WICKERSHAM..... 6201
The Albula Bridge, Solis, Switzerland, an illustration..... 6201
The Watson Plan of Grain Elevator.—2 illustrations..... 6203
Swift Ocean Steamers..... 6204
Sewage and Sewerage..... 6204

III. TECHNOLOGY.—Apparatus for Extracting Logwood.—1 figure... 6204
Stretching Machine for Ribbons and Tapes.—1 figure..... 6205
The Sands Gun Camera.—1 figure..... 6205
Antiseptic Substances..... 6205
Bourdon's Continuous Circulator..... 6208

IV. ELECTRICITY.—Microphonic Contacts.—3 figures..... 6205
Solenoid Galvanometer or Amperemeter.—3 figures..... 6206
Reis' Telephone.—1 figure..... 6207

V. NATURAL HISTORY.—Angular Motion in Wind Storms.—By JAMES HOGG..... 6203
A Recent Ascent of Popocatapetl..... 6210
The Nose-Ape.—Illustration..... 6212
Model of the Giant Octopus of the West Coast of America.—1 figure..... 6213
The Genus Phenacodus.—1 figure..... 6213
The Mines of Old Mexico..... 6214

VI. CHEMISTRY AND METALLURGY.—Determination of Lead from its Ore by Electrolysis.—By Prof. AD. SOMMER.—1 figure.... 6209
Separation of Nickel from Cobalt.—By G. VORTMANN..... 6209
Anthracene from Petroleum Residue..... 6209
Oxalic Acid..... 6209
The New Metal—Zircon..... 6214

VII. MEDICINE AND HYGIENE.—Perception of Colors in Darkness. 6209
Suture-Clamp Coaptation.—A New Method for Closing Wounds. By J. H. CIPPERLY, M.D..... 6210
Double Identity after Trepanning.—By J. N. MCCORMACK, M.D.. 6210
Corn Silk Pharmaceutical Preparations.—By GEO. W. KENNEDY. 6210

VIII. BIOGRAPHY.—Marcel Deprez.—Portrait..... 6207

IX. MISCELLANEOUS.—Scientific Exhibitions.—Magic Cabinets.—4 figures..... 6211
Large Sale of Mississippi Lands..... 6212

OVERTHROW OF THE BARB FENCE PATENTS.

For several years past the manufacture of barbed fencing wire has been under the control, substantially, of a single concern, namely, the Washburn & Moen Manufacturing Company, of Worcester, Mass. They acquired an eminent position in the trade, in its early days, by the exercise of superior skill and enterprise in producing machinery to make the wire, by honest endeavor to furnish a first class article, by promptness in filling orders, and finally by contenting themselves with a very small margin of profit. This was the original basis of their trade; it has been steadily maintained, and upon it has arisen the gigantic business now governed by the corporation. As soon as the barb fence business began to develop into large proportions, other makers became anxious to dip in and grasp a share; this they could only do by supplying an inferior article. To protect themselves as far as possible, to prevent the ingress and competition from makers of poor stuff, Washburn & Moen bought up all of the principal patents relating to barb fences; they then applied to the Patent Office and obtained reissues of some of the oldest of these patents, on which new and broad claims were allowed. Some of these reissued claims covered a wire or fence bar of any sort having barbs or points upon it. Other claims were for merchanism of any description for making any kind of barb fence. With these claims and reissues, some of which had been tried and sustained by the courts, the manufacture was so guarded and surrounded by bristling patent points, the margin of profit being low, that few makers have cared or ventured to fight the Worcester holders, but have preferred to pay them a small royalty as licensees.

Under several decisions of the Supreme Court of the United States in various cases, it has been laid down as a new rule that the reissue of an old patent so as to make it cover, by new claims, any new or broader ground than the original patent, is invalid. In view of these decisions Griesche and Fuchs refused to pay royalty to Washburn & Moen. Issue was joined, and on the 4th inst., in the United States Circuit Court, St. Louis, Mo., Judge Treat decided the case, holding, in effect, that the broad claims of the barb fence patents are invalid, both as respects the article produced and the machinery for making the same.

The magnitude of the barb fence business will be understood when we state that the estimate of the quantity of this fencing made in 1882 was 80,000 tons, or 500,000 miles in length. The firms claiming under their patents the exclusive right to manufacture barbed wire are said to have made within the year in royalties from their licenses and from extra profits in their own business between $4,000,000 and $5,000,000.

The royalty, though large in the aggregate, amounts in the detail only to $2 per 1,000 feet of fencing—not a heavy burden upon individual farmers.

Those who imagine that the overthrow of these patents is likely to result in any material reduction in the price of barb fencing, as paid by consumers, probably are mistaken. The decision may bring about a greater division of the trade and its profits than now exists; but where the margin of profit is already low there is not much room for the lessening of prices to the general public.

THE INDUCED CURRENT.

In our own little section, circumscribed by a very short radius, nature seems to be unceasingly striving to obtain an equilibrium: the war of the elements is constant; the changes are rapid; measured by our standard, the proportions are great—yet the grand harmony of the whole we guess at, but do not understand. A change in the density of the atmosphere is followed by wind: gales, hurricanes, and cyclones. Water seeking a level causes the current; mechanically, the moving water scours the bottom, erodes the banks, and carries a current of air along with it on the surface. We imitate nature in a miniature sort of way in regard to the actions of gases and liquids, and style the results induced currents.

If two copies of this paper be rolled up so as to form tubes, one two inches and the other one inch in diameter, all the apparatus is at hand with which to illustrate some of the more striking effects of these currents. Holding the larger tube pressed against the mouth, we blow through it and note the force with which the air strikes against the hand placed about three inches from the other end. Now if the tube be held a short distance from the face and we blow toward it with the same effort as at first, the pressure against the hand held in front of the other end will be much increased. In the first instance the current was only that of the expelled breath; in the second, this current, as it passed through the tube, drew along with it a certain portion of the surrounding air. A candle held near the face will be affected by these currents moving toward the entrance to the tube. Their presence can also be detected by the difference in temperature of the two currents, the second being the cooler. If we go through the same programme, but with the small tube held in the mouth, like results will follow. With the small tube fastened about half way through the other, leaving a space between sides of the two, we have a crude imitation of an important machine. Air or water sent through the outer tube, entering at the end from which the little tube projects, will make a powerful suction through the inner. On this plan the sand pump, so successfully used in the Hudson River Tunnel, is designed. That part corresponding to the small tube is placed in the mixture of sand and water, and water under heavy pressure forcde

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through the surrounding chamber, when the mixture is drawn up and carried away by the current. A similar method has proved most useful in dredging, and even a bottom of hardpan has yielded to the force of the inrushing water, and gravel and rock been sent rattling out through the tube.

In certain smelting operations, where the fumes are unhealthful, a suction placed instead of a blast has been found to remove all traces of the noxious gases. With the blast every little hole is an outlet for the gas, but with the suction the holes become harmless because of induced currents entering them.

When the hand is held near a stream of water flowing from a faucet, wind will be distinctly felt. The volume and force of this wind depend upon the volume and velocity of the water. A sluggish stream will produce no motion of the air that can be felt, but the same stream tumbling over a fall will create a gale. More than fifty years ago this fact was made use of by a mechanic residing in Watertown, this State. He constructed a box which he placed in front of the falls, as near the water as possible, leaving the side next the water open. This was connected at the bottom to a roughly-made wooden box, through which the current of air was led some distance to his shop where it furnished all the blast required by the forge. One of the schemes for utilizing a part of the enormous energy now wasting over Niagara is identical with the above. The measure of this force can be appreciated by those of our readers who have been near enough to the descending torrent to feel its influence.

One of the most characteristic features of the induced current is the apparent increase of power resulting from its use. With the hand held in front of the tube first mentioned the force is considerable, but if the hand be held the same distance from the mouth, say three inches, the expelled breath strikes it with a slightly greater force. The difference is caused by the friction in going through the tube, the effort to draw in the outer air, and the loss of particles of air which do not enter the tube.

AMERICAN ASTRONOMICAL SOCIETY.

At the June meeting of the American Astronomical Society, held at the Packer Institute, Brooklyn, June 4, the subject of the "Fuel of the Sun" was discussed for the second time. Professor Young, of Princeton, opening the discussion, said that to account for the heat of the sun there might be some truth in Helmholtz's notion that the sun is fed on its way through space with meteors attracted to it by its immense mass.

If this theory were true, then the earth ought to get as much heat from shooting stars as from the sun, and the surface of this globe would have three tons of meteoric matter to the square mile. Yet in some way this objection could be explained away. If we are to suppose that heat is derived from matter distributed through space, we should first remember that the matter would make itself felt on the planets of the solar system. Professor Proctor must be wrong in saying this does not necessarily follow. Another thing: if, as some suppose, a current of meteors toward the sun existed, then mischief would be played with comets. They would encounter resistance. Then, too, the temperature of the sun would not be hotter from such meteoric combustion than the carbon points in the electric light.

Professor Young had always supposed that the heat in the sun was not less than 10,000 degrees Centigrade. Yet, as a very slight increase of heat produces an immense increase of radiation, the heat of the sun might be lower than he had supposed; yet he could not believe it as low as that of an electric light. Another puzzling theory had been proposed, viz., that the sun sends its heat only to that which receives it, only to each of the planets, while space outside of a direct line from the sun to the planet remains cold. The idea being that the heat action between sun and planet was reciprocal like that of gravitation. The trouble with that theory was that heat must radiate on all sides, not in one direction only. Finally, there was a theory that solar heat was due to the contraction of the sun's body; the objection to the theory was that it put a limit to the universe. If it is a true hypothesis, then the sun could not be more than 15,000,000 years old, and it could not continue to give heat more than 15,000,000 years more. Such a limitation is not to be thought of.

The subject was further discussed by Mr. S. V. White, president of the society, Mr. G. P. Serviss, secretary, Professors Stevens, Levison, and Parkhurst, Mr. G. D. Hiscox, and other members of the society. The subject selected for discussion at the October meeting is the moon.

THE FRENCH PHYSICAL LABORATORIES.

It is within the memory of many now living that the first laboratory for the instruction of students in the science and art of chemistry was instituted by the celebrated Liebig, at Giessen. Previous to that time most of the chemical work and investigations had been done either in the back room of an apothecary shop or in the kitchen of some enthusiastic preacher like Priestley. The late Professor Woehler gave an interesting account of how he pursued the study of chemistry with the famous Berzelius in Sweden, and of how the faithful Anna washed dishes in one end of the room, while master and pupil solved the mysteries of nature in the other end of the same room. Probably the laboratory of this immortal Swede differed but little from the ordinary wash kitchen of to-day.

For many years American students, beginning with the now venerable James C. Booth, president of the American Chemical Society, flocked to the laboratory of Wöehler to obtain what they could not get on this side of the Atlantic, practical instruction in chemistry. Then came Bunsen and Kolbe, Kekule and Hofmann, and now Fittig and Meyer, with a host of others, who open their willing doors to American students. But the day is passed when chemical students are obliged to cross the ocean. Nine years ago a chemical laboratory was opened in this city where analysis was taught and practiced, and six or seven years ago a laboratory for research, equal to any in Europe, was opened in Baltimore. To-day no institution worthy the name of college lacks a chemical laboratory of some sort.

Why has chemistry enjoyed such an advantage over physics? About ten years ago Professor Pickering established the first working physical laboratory for purposes of instruction in the Institute of Technology, in Boston, and at a little later date Professor Mayer did the same at Hoboken. Now most of the larger cities, excepting New York, have a well equipped physical laboratory. Probably the best equipped of these is the one in Johns Hopkins University, but a new one is to be built in Cambridge soon, and we shall be disappointed if Professor Trowbridge does not make it the best in the world.

In Germany the Professor is more thought of than his laboratory, but where the former is excellent the latter is rarely poor. At present, Professor Kohlrausch, at Wurzburg, and Professor Helmholtz, in Berlin, seem to be the favorites with our countrymen.

The object to be attained by a course of instruction in physics is twofold: First, to obtain a thorough knowledge of the laws that govern matter and force; and an understanding of the action of heat, light, and electricity upon matter. Secondly, to acquire the power of investigating these properties and discovering new laws. It is unnecessary to say that a person should be familiar with known facts and laws before attempting to discover new ones. The former may be accomplished more or less perfectly by reading books and hearing lectures; the latter involves actual work; but we believe that the former is best accomplished by actual contact with the things themselves, so that their properties and relations may become familiar as solid, first-hand mental acquisitions, for this trains the judgment as well as develops the power of *correct* observation. This is not the opinion of all educators, for Prof. T. C. Mendenhall says that he "would relegate to the lecture table of the instructor all illustrative experiments and qualitative work necessary to a good understanding of the underlying principles of the subject, which every student should possess when he enters the laboratory."

Without venturing to differ with so distinguished an authority we still think that the majority of college students and others, especially those that do not intend to devote their lives to the pursuit of this science, but to become teachers, chemists, engineers, architects, inventors, etc., may derive much benefit from a course of practical instruction. What if the crude experiments of the student do seem to disprove the law that he was expected to establish? It leads him to take into consideration the secondary causes and conditions, and to make due allowance for errors of experiments. It were well for the business man, still more for a scientific man, to learn to distrust the adage that "seeing is believing."

In all the walks of life effects are traced to the wrong causes for want of the power or habit of making allowance for secondary causes. Charlatans would find their tricks exposed, mysterious sights and sounds lose their mystery, were people more capable of drawing correct conclusions from their observations. Wonder workers now excite the admiration only of the ignorant masses, but lawyers, politicians, and theologians impose upon the better educated, and scheming financiers, Keely-motor men, and pseudo-scientists succeed in robbing men of high intelligence, while we all yield our bodies and our purses to quacks and other doctors of medicine. In proportion to our ignorance of a subject is our danger of being duped by those skilled in its mysteries.

But to return to our laboratory; while the student should not be expected to rediscover for himself the principles of physical science, he may be allowed to verify these laws by measurements and determinations of his own until he *feels* rather than *thinks* these laws are true. And while doing this he has learned his own personal coefficient of error and is gradually reducing it to a reasonable limit.

Having given our views, the results of much observation and study, as to what can be done in a physical laboratory, without, however, claiming for them any originality, we will conclude with a brief description of the physical laboratory under the direction of Professor Desain in the Sorbonne, Paris.

At the time of our visit it occupied a number of separate and distinct rooms scattered about in the old buildings that constitute a portion of that venerable institution. In each room was from one to three pieces of apparatus. Near each there hung, in a little frame, brief directions in French for performing a given experiment, and formula for calculating the results. The experiments were usually such as could be satisfactorily performed in two hours, and the sessions were limited to that time—10 to 12 A.M. Professor Desain and several assistants were then on hand to give advice, explain difficulties, and offer suggestions.

The following is an incomplete list of principal experiments to be performed, but this particular order was not insisted upon, as no two men could use the same instrument the same day, and each important piece of apparatus was usually engaged a week in advance. Of course a person experimenting with light was expected to finish that before taking up electricity, or *vice versa*, but when sunlight was required, of course the clerk of the weather had to be consulted.

1. Making and graduating thermometers.
2. Estimating the density of a vapor, by Dumas's method.
3. Measuring the magnifying power of microscopes.
4. Measuring the length of waves of light by Fresnel's mirrors.
5. Ditto with Newton's rings viewed obliquely.
6. Ditto, viewed perpendicularly.
7. Ditto, with Billet's demi-lenses.
8. Ditto, with a diffraction spectrum.
9. Use of Norremberg's polarizing apparatus.
10. Use of Biot's rings.
11. Use of Babinet's compensator.
12. Use of Hoffman's polarizing microscpe.
13. Circular polarization. Biot's laws verified.
14. Jellett's apparatus.
15. Measuring the rotatory power of quartz crystals.
16. Soleil's saccharimeter.
17. Laurent's saccharimeter.
18. Reflection from metals, Jamin's apparatus.
19. Index of refraction measured with a prism.
20. Ditto, by interference, Jamin's mirrors.
21. Calorific spectrum of the sun.
24. Absorption of heat.
23. Polarization of heat, and law of Malus.
22. Use of Melloui's apparatus.
25. Reflection of heat.
26. Internal resistance of batteries.
27. Resistance of wires, Wheatstone's bridge.
28. Measurement of electromotive force.
29. Measuring the horizontal component of the earth's magnetism. M. T.

It will be noticed that the experiments upon heat and light were numerous and exhaustive, this laboratory being particularly well equipped with excellent apparatus for that purpose. In certain other laboratories, where these receive less attention, electricity and magnetism are better represented.

On the whole, we cannot refrain from saying that a course of experimental physics under Professor Desain well repays the time it takes, while his kindness compensates for his ignorance of our tongue. E. J. H.

ROUND NOSES VS. DIAMOND SHAPE.

Unlike most mechanics, the machinist has a liberty of individual expression, one that is not shared by mechanics generally. It is shown in his selection and origination of shapes for tools. And yet there is no department of mechanics where so much of system and absolute rule exists as in that of the machinist; the reproduction of the same sort of machine tools and the duplicating of the same styles of producing machinery is the main object of the machine shop. The production of uniformity in the parts of machines, which is gradually extending, demands absolute system in many of the tools used— system as to form, size, material, and methods of operating. Yet with all this tendency to uniformity the machinist is largely independent in his selection of forms of bench, lathe, and planer tools. Adopted shapes of tools, which are not necessarily determined by gauge, have not been successfully introduced into any shops. Attempts have been made, in some instances, to designate the style of lathe turning tools and planing cutters for certain purposes, as roughing and finishing, which do not necessitate gauge exactness. But, even if the tool-forger works to any prescribed pattern, the tool-user can change its characteristics at the grind-stone; a right of which he is not slow to avail himself.

In the use of interchangeable lathe and planer tools—stock and bit, instead of solid tool—there has been a pressure, in some instances, to substitute a round-nosed cutter for the diamond point for roughing up and also for finishing. It would be difficult to convince any machinist, not educated to the round-nosed tool, to believe that it will do the work as rapidly and as well as the ordinary diamond point does. Different workmen have their different shapes for the diamond point. Most experienced machinists insist upon having the innermost cutting point—that which reaches nearest the center of the work—somewhat higher or more projecting than the after-cut portion. Then there are others who insist that a level top to the tool is the best, but one of the most experienced workmen, with many years of practice to draw from, insists that the point of the turning tool—the diamond point—shall be the lowest of any cutting portion, and illustrates it by a pocket knife and a round stick to prove that the cutting of the iron should not be a wedging and gouging out of the material, but a shaving of it off from the core by such a shape of the tool as to insure a drawing cut.

It would be difficult, even after experimental tests, to decide upon any one particular form for these tools, so much depends upon the user, the workman. One man will turn out a large amount of excellent work with a tool that another would condemn as almost useless; so, although the practice may be indulging "quirks" and fancies, it is probably good policy to allow freedom to the workman in this respect, so long as it does not degenerate into costly experimental folly.

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Friction Wheels.

So much has been published in mechanical periodicals and manuals about belts and gears that another method of transmitting power appears to be well nigh neglected. But for many purposes where absolute contact is permissible or desirable, the use of friction wheels is an excellent substitute for gears. The advantage which they formerly possessed over gears, that of noiselessness, may no longer exist, for gears are made now to run in perfect silence—that is, gears which are properly cut. But friction wheels have other merits, not the least of which is that the machine they drive can be instantly stopped and started by the slightest separation of their surfaces. These wheels can be used in any position where gears can be run, and may be of bevel or of flat faces. The faces require, however, to be held in close contact while running, as it is upon their friction that their action depends. The face of one of the wheels must be of a somewhat yielding or elastic character, as of leather or wood. Vulcanized rubber and the composition known as "vegetable fiber" are also used. The driving wheel face should always be of the softer material, or it will speedily become worn into hollows. As an instance, let the machine to be driven be suddenly stopped by the slight lifting of the face of the driving wheel. The driving wheel continues to revolve, and when the machine is started again by pressing the two wheels together, the driving wheel will rotate against a single point on the face of the driven wheel before the inertia of the machine can be overcome. In this case, if the driving wheel face is of iron and the face of the driven wheel of leather, the leather will soon be worn into corrugations across its width.

Wheels having faces of the same material also work well together, as two wooden faced wheels, or two of rubber. The wood ought to present the ends of its fibers, the blocks being set radially in a skeleton wheel of iron. Wooden wheels should be kept from moisture, which tends to soften and swell them, rapidly impairing their shape, and rubber wheels should be kept from oil of all kinds, which soon rots this material.

Tanned Fabrics.

The *Chronique Industrielle* states that Mr. H. J. Piron has recently invented a process of rendering fabrics impermeable and preventing their rotting, without interfering with their softness or increasing their weight. This process he calls "tanning."

It is well known that the bandages that surround the heads of Egyptian mummies are always found to be remarkably well preserved. Now, this is due to the fact that they have been impregnated with some sort of resin. Mr. Piron thought, then, that in order to preserve vegetable fibers it would be necessary to have recourse to the vegetable kingdom, and he therefore turned his researches in this direction. Of all the products that he tried, the one to which he gave preference was that which is extracted from birch bark, and which serves for perfuming Russia leather. When birch bark is distilled there is obtained a light oil, one-quarter of which consists of a peculiar phenol, and this latter is what communicates that well-known agreeable odor to the above-named leather. It results from recent investigations that the green tar of birch contains neither acid nor alkaloid. This tar forms with alcohol a solution which is at first very fluid, but one which when once dried, resinified, becomes proof against the action of alcohol. This solution unites with the most brilliant colors.

As may well be imagined, these qualities permit of its entering thoroughly into every portion of a fabric. Not only does it fill the capillary vessels, but it also covers them with a varnish possessed of great elasticity, unaffected by acids and the corrosive action of sea water, and well enduring changes in temperature. Its density is slight, and it therefore but slightly increases the weight of the fabric prepared with it. This varnish is not only inexpensive, but satisfies all the conditions required of such a material; and the aromatic odor that it possesses has the merit likewise of keeping out insects. As for microscopic vegetations, such as mildews and moulds, these cannot develop in the prepared fabric, inasmuch as it is impossible for air or water to gain access to the fibers. Mr. Piron's invention is applicable to all fabrics made of vegetable fibers, as well as to rope, cordage, etc.

ACCORDING to the *Milling World*, sackcloth or canvas can be made as impervious to moisture as leather, by steeping it in a decoction of one pound of oak bark with fourteen pounds of boiling water. This quantity is sufficient for eight yards of stuff. The cloth has to soak twenty-four hours, when it is taken out, passed through running water, and hung up to dry. The flax and hemp fibers, in absorbing the tannin, are at the same time better fitted to resist wear.

THE COLUMBIA TRICYCLE.

The mechanical refinements applied in the construction of bicycles have not only created a demand for the tricycle, but have brought out the adequate means for supplying it; and it is a matter of gratification that Americans have contributed as much to the structure of the modern tricycle as they did to its precursor.

We find the latest and best development of tricycle in the Columbia of American manufacture. Two large driving and supporting wheels abreast, one smaller steadying and steering wheel in front, rotary crank action and chain transmitting devices for propelling mechanism, equal communication of power to both driving wheels, with means for differentiating it for curves, adaptation for position for driving by means of changing the weight of the rider from one point to another, in a natural and easy motion; adjustability of seat and handles; tubular metallic construction of frame, and steel suspension wheels; round rubber tires, and polygonal pedals; these are some of the necessary points in the true type of a tricycle.

Fig. 2.

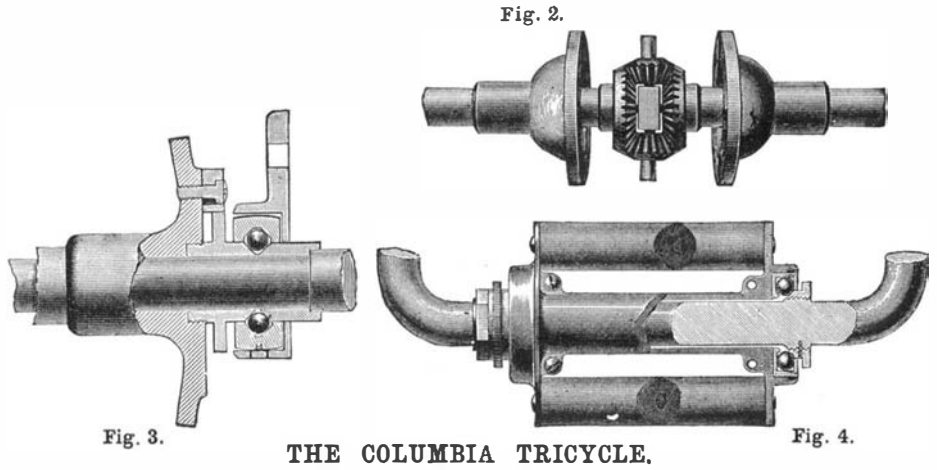

Fig. 3. Fig. 4.

THE COLUMBIA TRICYCLE.

The new Columbia tricycle is the product of the largest and oldest manufacturer, the Pope Manufacturing Company, of Boston. It is made on the interchangeable system. Rotary pedal action has been adopted, because it is best, mechanically and physiologically, for easy and effective propulsion.

The position of the crank shaft, with reference to the axle of the driving wheels and to the seat, and the position of the pedals on the crank shaft, are such as both to preserve the proper balance or poise of machine and rider and to secure the advantage of driving by weight of rider more than by muscular thrust. The 50-inch driving wheels roll over obstructions with ease, and also give a certain dignity of appearance to the machine and rider, while the application of the fine chain gear is such as to increase the leverage. The Columbia tricycle is a genuine "double driver," the propulsion operating evenly and directly upon both driving wheels. This result is obtained by the very ingenious compensating gear, which consists in mounting the two driving wheels independently, and connecting them on their axles by small toothed wheels (Fig. 2), so arranged and operating in connection with the chain wheel as to distribute the power to the two wheels in proportion to the resistance, evenly on a smooth, straight course, more to the outer wheel on a curve when it travels faster than the other and more distance, and more to the trigged wheel where obstruction is unequal, and the whole is completely automatic.

The frame and general construction of this tricycle is well shown in the large cut, the frame being of fine steel tubing and very rigid, the rack and pinion front steering mechanism allowing the track to be visible for all three wheels. The seat is adjustable, both fore and aft, and vertically, and the handles are inclined, so that the pull upon them is in the line of the rods, and the position of the hands is very comfortable and natural. The wheels are made with good width of hub and flange, a large number of spokes, and with deep and rigid rims. The tires are moulded in endless rings of the best rubber, and will show the earned reputation of Columbia tires for never coming loose.

One of the most ingenious and effective parts of this new tricycle is a friction brake, applied in the form of two disks to the chain wheel, with an arrangement by which almost unlimited pressure can be brought to bear, and the machine brought to a halt on the steepest incline. The Columbia ball bearing (Figs. 3 and 4) has done as much as any other one feature of construction to give the machines of this manufacture their reputation. There are two sets on the main shaft, two sets on the crank shaft, one set in the front wheel, and two sets in each pedal, so that however the weight or the speed may be distributed, friction is reduced to a minimum. Swivel or compensating bearing box cases are provided for these bearings, so that the bearings are always true.

This tricycle is constructed for general use, under all sorts of circumstances, on all sorts of roads, by ladies and gentlemen, by the light or heavy, and for taking a reasonable amount of baggage. It is a comparatively light machine, as light as it seems practicable to make without leaving out desirable things, and saving metal where it is needed, and it is exceptionally easy running.

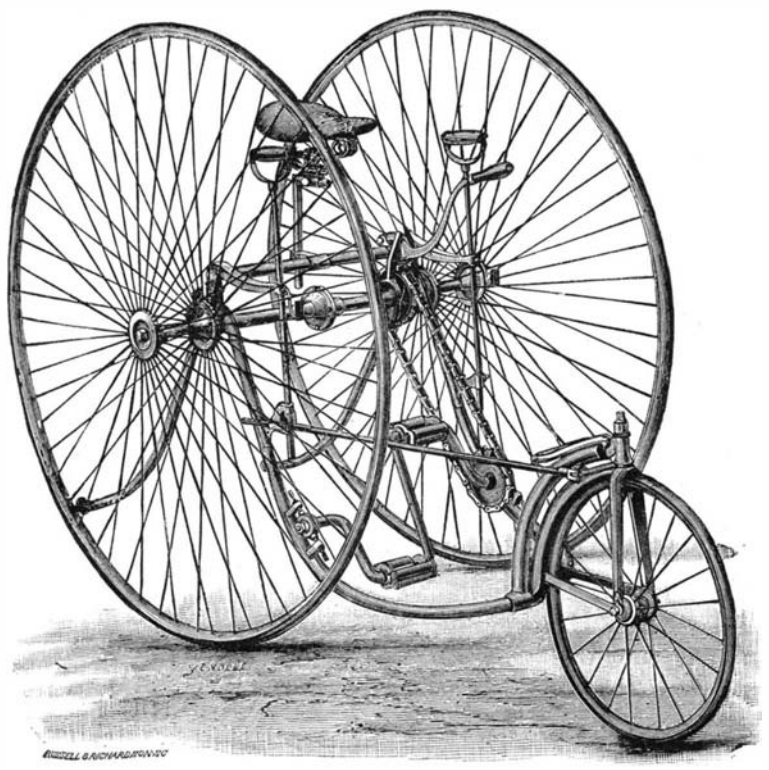

Fig. 1.—THE COLUMBIA TRICYCLE.

Roofing-linen.

According to the *Deutsche Bauzeitung*, a new covering material called "roofing-linen" has been introduced, which is about half the thickness of good *carton-pierre*, and consists of a layer of coarse linen which lies between two layers of thin roll-paper. The cohesion of the three layers is effected by an asphalt composition of special make, called "roofing-paint." It is stated that this paint should be freely applied to roofs immediately after their completion, and again about six weeks afterwards. This operation should, it would seem, be repeated every few years. The linen costs about 10*d.* to 11*d.* per square yard, and the paint 10*s.* to 11*s.* per cwt. Although this new method appears to have points which deserve commendation, a real estimate of its value cannot be formed until the material has been exposed to the test of several years' use.

Mechanics' Apprentices.

In an article—"Apprentices to Mechanical Trades"—in our issue of May 19, it was stated that the facts show the popular opinion that learning mechanical trades had fallen into disfavor with our boys to be erroneous, and the experience of a single establishment was given to substantiate that view. That establishment is the Pratt & Whitney Company, Hartford, Conn. In a subsequent conversation with Mr. F. A. Pratt, the president of the company, he stated that he employs as many apprentices as can be usefully occupied, about 70 or 80 in a total force of nearly 700 hands, and in a large proportion of cases the apprentices endeavor to be retained in employment at the end of their apprenticeship. Mr. Pratt believes it to be profitable and economical for the company to educate their own workmen, and not only are their "day hands" largely from their own apprentices, but a large proportion of the contractors also. The applicants for apprenticeships come from all parts of the country, are frequently high school graduates, or from the Sheffield Scientific School, New Haven, and the applications are so numerous that the company can take their choice of boys with good school educations and proper, manly habits.

Alluding to the article in a letter, Mr. Robert Allison, proprietor of the Franklin Iron Works, Port Carbon, Pa., gives some facts relative to his own practice in regard to apprentices, which is similar to that of the Pratt & Whitney Company. With a total force of from 75 to 100, Mr. Allison educates from nine to eleven apprentices, who are taken for three and a half years on the terms of 50 cents per day for the first year, 60 cents for the second year, 70 cents for the third, and 80 cents for the last six months. Twenty-five cents per week is retained from the wages as a bond for faithful service to the end of the term, and is returned to the apprentice in its accumulated form at that time. Lost time, except holidays, may be deducted, at the pleasure of the employer. A brief probation is a preliminary to the final contract of apprenticeship, to ascertain the fitness of the candidate. Under these conditions the applications are thirty or forty to one reception, which shows that the desire to learn trades has not died out among American youth.

FRENCH silk manufacturers are reported to be very hopeful as to the capabilities of a big spider lately discovered in Africa, which weaves a yellow web of great strength and elasticity.

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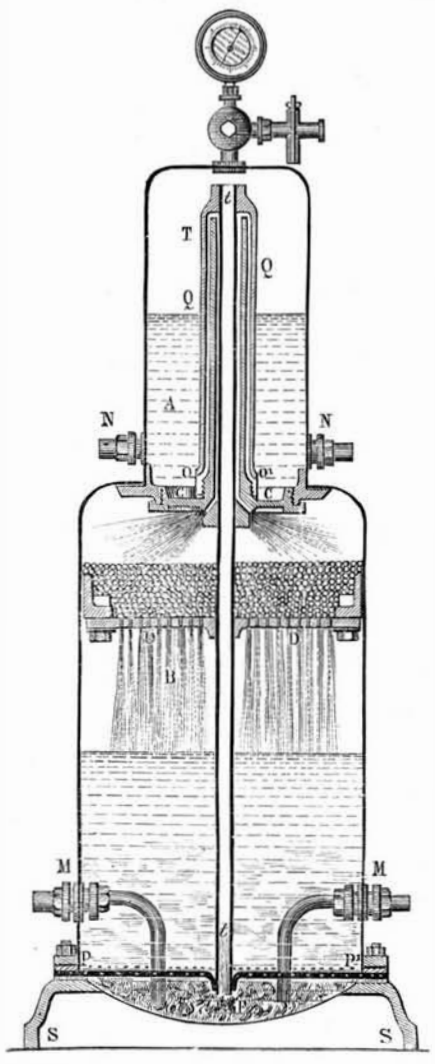
MIXER FOR CARBONIC GAS AND WATER.

The engravings show an apparatus invented by M. Mondollot for intimately mixing carbonic gas and water without a mechanical agitator, to which there are serious objections. The means for charging water with an effervescing gas by this device are very simple and said to be effective. Friction is avoided, leakage is prevented, and the bottling is unattended by violent spurts and ebullition.



THE CASCADE SATURATOR.

The apparatus consists of two vessels, or chambers, A and B, separated by the partition, C. The smaller one, at the top, is the distributer, and the other the accumulator. The gas and water are forced by a pump through the pipes, N, into the distributer, where they separate in consequence of difference in weight. As the pressure increases by the action of the pump the water rises in the tubes, O, and descends to the diverging annular space in the top of the accumulator, where it is forced in spray through the apertures, *i*, on a mass of broken marble, or other carbonate of lime material, through which it passes and descends through the perforated diaphragm, D, in a fine mist.

The water during this process is in contact with the carbonic acid gas at a high pressure, and becomes thoroughly charged. The gas escapes from the distributer by the central tube, *t*, into the bottom of the accumulator, where it passes through the perforated plate in little bubbles. Bottles, or other vessels, are filled at the pipes, M.

It will be seen that as the pressure in the lower cylinder decreases by drawing from it, and increases in the upper cylinder by the action of the pump, there is a constant tendency to equilibrium, the water under pressure falling in a cascade into the gas, and the gas, under pressure, rising through the water, giving the largest amount of contact surface.

Ensilage.

Mr. Atkinson, of Boston, recently sent a cask of maize fodder and a cask of rye to Professor Voelcker, the well-known agricultural chemist of England, with the view of showing the sort of ensilage prepared in America. Having analyzed the samples, the Professor reported the maize fodder to be perfectly sound and the rye very slightly mouldy; but both were wholesome food for cattle. A little cotton-seed meal having been added to the fodder, it was given to cows on an experimental farm. They took to the ensilage at once, and evidently enjoyed it. With careful management, Mr. Atkinson calculates that four cows can be maintained in good condition to one acre of ensilage.

* Translated from *Bulletin du Musee de l'Industrie.*

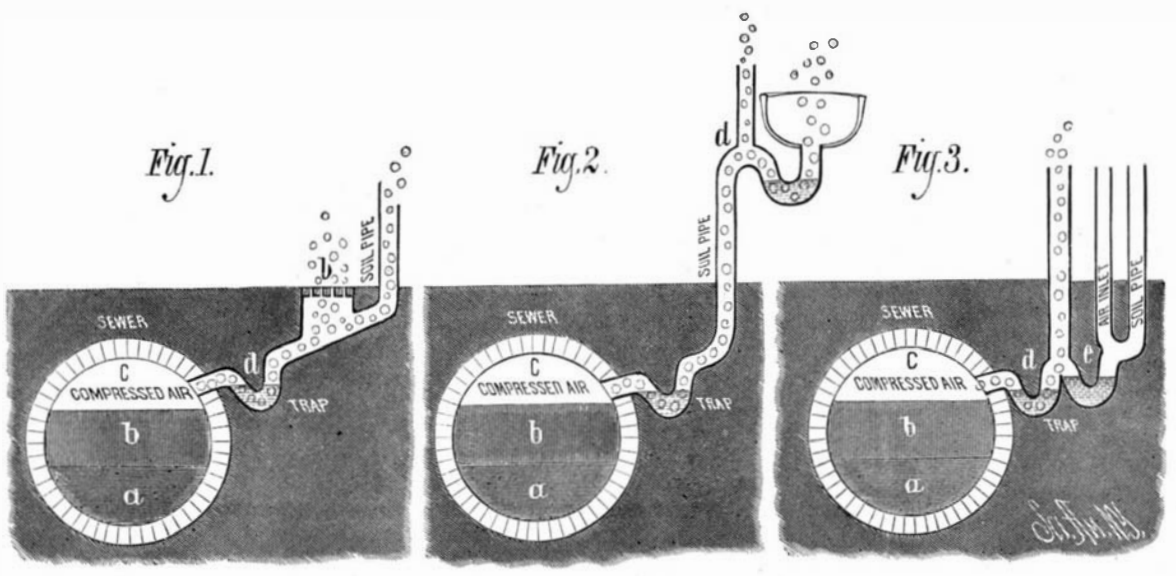
THE INFLUENCE OF STORMS UPON WATER TRAPS.

The last issue of the *Sanitary Record* (London) contains a valuable article on "The Influence of Storms upon Water Traps," by Henry Masters. The points he makes have application in cities in which the sewers are not ventilated. Strangely, there is considerable opposition to sewer ventilation, or, at the least, indifference to it; the result is indicated below.

There are three influences which affect the water seal of a trap, viz., the diffusion of gases, the absorption of gases by the trap water, and pressure by storm water; it is the latter influence which I propose in this paper to describe. I will suppose a common sewer to be cylindrical, and in dry weather the quantity of sewage passing through it is shown by the horizontal lines at *a*, Figs. 1, 2, and 3, and the space, *b* and *c*, above the average sewage contains sewer air; so long as the sewage does not rise above the average height, *a*, no pressure exists (except by the diffusion of gases, with which at present we have nothing to do). But suppose a storm occurs, and sufficient water passes into the sewer by way of the street gullies and house drains to raise the water in the sewer to the perpendicular lines, *b*, a certain amount of pressure will be the result, and the air, *b* and *c*, will be compressed into the smaller space, *c*, and in the proportion of *b* to *c*. The condition of the sewer air will now be much more dense and elastic, and press equally upon the intrados of the sewer and on the surface of the sewage, and if there were no escape for the compressed air, and the storm water rose higher and higher, the air would become denser and denser, until the pressure of the imprisoned air became equal to the entrance supply column of storm water, and then the water would cease rising; in our unventilated sewers this condition of things would exist, if it were not that a large number of house drains join the common sewer somewhat in the manner shown in my diagrams.

I have shown upon Fig. 1 an open disconnecting trap, *d*, and what would be influence of water rising (as I have described) upon such trap. The compressed sewer air is being forced into the house drains, as shown by a series of circles; in the first place, the air will force the trap at *d*, and then may escape into the open air through the perforated cover, *b*. But if the soil pipe, *c*, be open at its top, or there be any defect in it or in the house drains, there is a possibility of an up or inward current being established, and a portion of such sewer air be drawn into the house drains and escape by way of the soil pipe, or into the house; thus, to a large extent, the house drains will not be effectually cut off from the common sewers, for sewer air by entering the house drains neutralizes to a considerable extent the value of the disconnecting trap.

Fig. 2 shows a common arrangement of trapping drains, and, also, a common arrangement of four inch soil pipe ventilation by the extension of the soil pipe less in capacity than the soil pipe itself; it is not an uncommon thing to find such extension pipes varying from three-eighths of an inch to three inches in size. The effect of pressure in such cases is as I have again shown by circles (see Fig. 2). It will be seen that the compressed air ascends freely until it reaches the bend of the soil pipe at *d*, and at this point a portion escapes up by the small soil pipe extension and into the open air, as shown by small circles, but the major part forces the closet trap, and, of course, enters the house, thus showing for effective ventilation the absolute importance of soil pipes being extended their full size, and, if terminals of any kind be fixed upon their upper ends, the openings of such terminals must be at least of the same area as the soil pipe, for any less size would check the ascension of the air, and an undue pressure be put upon the closet trap water, and the chance of the water seal being broken in consequence.



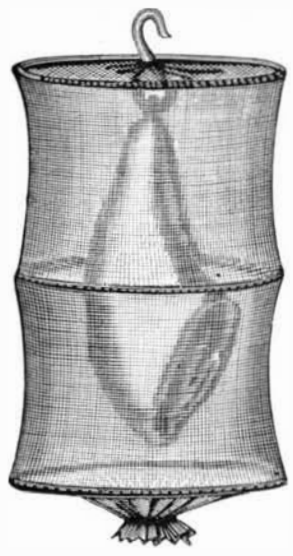
THE INFLUENCE OF STORMS UPON WATER TRAPS.

The effect of air pressure upon a double water seal trap is shown in Fig. 3, and although the compressed air, as in Figs. 1, and 2, forces its way through the trap, *d*, nearest the sewer (the escape being of the same area as the drain itself), the inner trap, *e*, will not be affected by pressure; the sewer air is effectually prevented from entering the house drains by this precaution, showing the importance of two complete water seals to a main trap, and, also, that a large escape pipe should be set between the traps.

In dealing with large soil pipe drains, great difficulties exist in effectually arranging the drainage of a house so as to exclude sewer gas, and to exclude this no one will doubt to be of primary importance. If a disconnecting chamber, or an escape pipe, be the safeguard adopted, the perforated grating, or pipe, should be of equal area to the drains it has to relieve; thus, a nine inch drain must be provided with perforations or pipe equal to about sixty-three superficial inches, a six inch drain twenty-eight inches, and a four inch drain thirteen inches. Perfect safety cannot be obtained unless this rule is made absolute.

PORTABLE MEAT SAFE.

This is a very simple invention which will prove exceedingly useful in summer to protect joints of meat from flies



PORTABLE MEAT SAFE.

or insects. The hook is intended to hold the joint, and the hoop prevents the gauze from coming in contact with the meat. As the joint is completely surrounded by the gauze it is impossible for the flies to effect an entrance.

Silico-fluoride of Ammonia as Test for Boric Acid.

Prof. Stolba says that many boron salts, especially those soluble in water, impart a fine green color to the alcohol or colorless gas flame when mixed with silico fluoride of ammonia.

Owing to the intensity of the color, this reaction can be made use of for testing for boron in substances that are totally insoluble in water and acids, as, for example, in glass, enamels, tourmaline, axinite, etc. He proceeds as follows: The substance to be tested is pulverized and mixed with an excess of carbonate of soda and fused. When the fused mass is cool, it is ground to a very fine powder and mixed with an equal part of the silico-fluoride.

When this mixture is brought into the flame on a platinum or even an iron wire, the smallest trace of boron will be indicated by a very distinct and persistent green color.—*Listy Chemicke.*

Aluminum-coated Iron.

Dr. Gehring, of Landshut, has invented a process by which ordinary iron may be rendered highly ornamental. The invention—of which, however, we have heard very little lately—of obtaining aluminum very cheaply led Dr. Gehring to coat iron with aluminum, in the same way as iron plates are now tinned, and converted into tin-plates. The inventor states that his process is inexpensive. He uses a Bunsen burner with a blast or a muffle, and is thus able to manufacture various objects of the durable metal for daily use, the coating of aluminum giving them a silver white luster. He also produces a gold luster or any other color, and even an enamel coating, all of which substances are said to adhere very firmly to aluminum. Aluminum, like tin, does not oxidize under normal conditions, and even stands the heat of an ordinary fire, while it is much more lustrous than tin.

THE production of rails of various descriptions in the United States last year was as follows: Bessemer steel, 1,438,155 tons; iron, 227,874 tons; open hearth steel, 22,765 tons; total, 1,688,794 tons. The corresponding production in 1882 was as follows: Bessemer steel, 1,330,302 tons; iron, 488,581 tons; open hearth steel, 25,217 tons; total, 1,844,100.

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Fire-proof Passenger Cars.

The *New York Herald* says that there is no good reason why all passenger cars on steam roads should not be thoroughly fire-proof, and that it is high time that a new departure in this respect should be taken, as it seems easy and entirely practicable to construct passenger cars of metal or other incombustible material.

By way of comment on the above, remarks *The National Car-Builder*, it may be said that the traveling public will be provided with fire-proof cars at some future time, perhaps, but not until there is a more urgent demand for them than exists at present. Just now the demand is light, because the great mass of people are very well satisfied with what they have, or would be, if cars were a trifle more luxurious, stylish, and exquisite than they are. The vast majority of travelers will take the chances when they journey in winter, rather than dispense with the hot stoves to which they have been so long accustomed; and as for any new-fangled incombustible wood finish, they will continue to prefer the elegant cabinet work and gilded and varnished surfaces to anything plainer and safer.

Metallic car bodies are no new idea. They have been built of iron tubes and steel rods framed together, with an outside covering of sheet iron, and have done fair service as freight cars. It has been proposed to construct passenger cars on the same plan, the inside finish being wood, of course; but we are not aware that any such cars have yet been built and put in service. There is evidently but one way to make a fire-proof car or a fire-proof building, and that is to construct it throughout of materials that will not burn under any circumstances. The best of the so-called fire-proof buildings are not entirely so. They always contain some wood-work as well as furniture and other property, more or less, that will readily take fire, and the same may be said with respect to railway passenger cars. The framing and floors may be made of metal and the outside paneling of iron or of wood well covered with metallic fire-proof paint. The inside can also be of sheet metal or of wood saturated with chemical ingredients that are said to render it incombustible, or nearly so. The seat frames can also be made of iron, and the cushions and backs with the least possible upholstering necessary for the comfort of the sitter. But would such cars be pleasant to ride in? Would the great traveling public, after being pampered so excessively during all these years with luxurious and palatial finery in car decoration, be willing to dispense with mahogany, rosewood, and varnish (all of which will ignite about as quickly as petroleum) for plain surfaces of fire-proof paint, just for the satisfaction of knowing that however cruelly they might be transfixed or crushed in a collision by fragments of iron or incombustible wood, they would not be burned alive or cremated? Some people, doubtless, would be willing to do so, but the great majority would not. The mass of people would, and do, prefer to take the chances, just as they do when they put up at six story tinder-box hotels, feeling in all their bones that after *us* comes the midnight conflagration with its horrors unspeakable.

When the demand for safety, as against fire, in railway cars shall become so pressing and universal as to make some effective provision for it indispensable, it will probably be found that there is another way of cornering the problem without resorting to the difficult and even questionable expedient of making cars fire-proof, and that is, not to carry any fire in them. This would not, of course, prevent the burning of cars from outside contact with fire, but it would prevent conflagrations from originating inside—a class of accidents which are the most to be dreaded, and which have hitherto in our railway history been fearfully destructive of human life. The warming of cars with steam or hot water, conveyed from the locomotive or supplied by a special apparatus in baggage cars, is barely practicable, perhaps; but thus far the unsuccessful efforts of inventors to devise a good practicable working plan is an evidence of the difficulties which lie in the way of the general adoption of these methods.

Pneumatic Transmission of Power.

The transmission of power to long distances and its economic distribution over wide areas by a special agency is a thing greatly to be desired, and is, morever, more easily conceived than accomplished. Water has been laid largely and successfully under contribution in this respect. Air has also been utilized, and the principle finds an exponent in the gas engine. It has further been demonstrated of late that, other things being equal, electricity in a secondary form is well adapted for this purpose. Compressed air is now largely employed in Paris for the transmission of time by mechanical means—the pneumatic clock system—and it has also for long past been used for other mechanical purposes, as in mining and tunneling operations.

In regard to the distribution of hydraulic power from a given center over a large area, Hull presents a notable example, that town having been the first to adopt the system through the Hull Hydraulic Power Works, of which Mr. Henry Robinson was the engineer. What has been done in Hull and what is now being effected in other towns with respect to the distribution of power by means of water, it is now proposed to do in Birmingham by means of compressed air. The proposition is to compress the air on a large scale at a central depot or station, and to distribute it throughout he manufacturing portion of the town by means of mains and supply pipes, just as gas and water are now supplied. One great advantage of compressed air is that it can be used to drive existing engines without involving any change of plant. Moreover, steam users would be enabled to dispense with their boilers and utilize the space for other purposes, the services of the stoker also being dispensed with. There are also some other collateral advantages to be secured, to which we shall presently refer.

The requirements of the district to be supplied have been carefully considered, and in order to determine the position and extent of the proposed works, the number of steam users in the proposed district were ascertained. The wards selected were those of St. Bartholomew, Deritend, and St. Martin, and the following is an analysis of the results. It was found that there are—

164	engines	varying	from	⅛	to	10	h.p.,	with total of	710 h.p. nom.
59	"	"	"	11	to	20	"	"	843½ " "
15	"	"	"	21	to	30	"	"	393 " "
6	"	"	"	32	to	50	"	"	220 " "
10	"	"	"	52	to	100	"	"	574 " "
4	"	"	"	102	to	289	"	"	818 " "
								Total	3,558½

It is assumed that of the above only engines up to 30 horse power nominal would be likely to use compressed air. Upon this assumption, then, we have—

For 10	h.p.	and	under,	710	h.p.	nom.	yielding say	2,130 h.p. ind.
" 20	"	"		843½	"	"	"	2,529 " "
" 30	"	"		393	"	"	"	1,179 " "
Total indicated horse power of engines of a size to work with most advantage by compressed air								5,838 " "

These figures, however, only represent the engines now actually in use, but it is to be presumed that the existence of such a convenient and cheap power would attract other manufacturers requiring motive power to the district in which the mains would be laid. Besides this, there are many additional purposes, such as for driving small machinery and for ventilation, for which compressed air is specially applicable. In view, however, of the existing requirements of the districts proposed to be first dealt with, it is proposed to provide machinery and plant capable of delivering 5,000 indicated horse power in compressed air, and at the same time to provide room for extension to double that amount.

The site selected for the works is a piece of land belonging to the Birmingham and Warwick Canal Company situated on the canal side and facing Sampson Road North and Henley Street. Upon half of this site it is proposed to erect four air compressing engines driven by compound condensing steam engines, giving a total of 8,400 indicated horse power (which it is calculated will be sufficient to produce the 5,000 horse power required to be delivered) and forty-four Cornish or Lancashire boilers, together with air purifying apparatus, and the necessary buildings and offices. Before entering the air compressing cylinders the outer air will be passed through an air filtering and purifying apparatus, by which it will be cleared of soot, dust, and other impurities, in order that it may reach the consumers in a thoroughly pure state.

The air pressure to be delivered has been fixed at a minimum of 45 pounds effective, or 59·7 pounds absolute, as being sufficient to cover the majority of cases, and more economical of production than a higher pressure. In the few exceptional cases, however, where the existing engines work at a higher steam pressure, a slight alteration in the gearing or pulleys connecting to the main driving shaft, so as to run the engine at a higher speed, would enable the lower air pressure to carry the load. Where such alteration is not possible or convenient, the bore of the cylinder may be increased, or even a new cylinder introduced of larger bore, at very slight cost. The maximum pressure in the mains would be 50 pounds per square inch, and on reaching the consumer's premises the air would be heated wherever practicable. Before entering the engine the quantity of air supplied would be measured by a meter, or otherwise in the engine itself by a counter registering the speed and average point of cut-off and expansion.

It is unnecessary here to enumerate the many purposes for which compressed air can be utilized; to do so would be to extend the length of this article inordinately. Suffice it to say that there are some special applications in which this power is very desirable, and would prove most convenient. Let us turn, then, in conclusion, to the advantages compressed air presents apart from its use as a source of motive power. Foremost stands its hygienic advantages, and first among these would evidently be an important abatement of the smoke nuisance, by the abolition of a number of small factory chimneys which deliver their smoke at a comparatively low level.

There would then be, *per contra*, the introduction into the manufacturing parts of the town of large volumes of pure air instead of noxious vapors from the chimneys. An improved ventilation of workshops would also result from the exhaust air from the executive engines. There would likewise be the diminished risk of boiler explosions and of the consequent damage to life and property from that cause, while the public health generally would be improved by means of the purer atmosphere of the town. On the whole, there would appear to be nothing but advantage attending the working of such a scheme, and we hope in the public interest to see it carried out.—*Iron.*

IT is sagaciously noted that to determine the value of building stone a ramble among the tombs is wise. In far fewer years than most imagine monuments are in decay.

The Salmon Trade of Oregon.

There are now on the Columbia River alone not less than thirty-five canneries, which produced in 1882 about 540,000 cases of canned salmon, and including the other rivers from the Sacramento to the south of Alaska. On the north the product of canned salmon for 1882 was not far from 1,000,000 cases, with a value of about $5,000,000.

In Mr. Hittel's "Commerce and Industries of the Pacific Coast," we find the following information concerning the canning interest of the Columbia: The salmon fishery of the Columbia gives employment in the season to 5,600 men, 3,100 Chinamen being employed in the canneries, while 2,500 whites take charge of the boats and nets. The cannery proprietors own 1,200 boats, and lease them with nets and all the necessary tools and supplies to the fishermen, a large proportion of whom are Scandinavians, Italians, and Finns, who, as rent, must give one-third of the catch, and must sell the other two-thirds at a stipulated price. Each boat has two men, a captain and a helper. The former hires the latter, boards him, and gives him ten cents for every fish caught. The fishermen who own their boats and nets sell where they please, but usually receive the same price as is paid to the men using the cannery boats. It is expected that the captain of a boat will make at least $100, and his helper $70 a month for their labor. The average catch of a boat for a season may be 2,000 fish, worth $1,200, equivalent to $300 a month, of which $100 is allowed for the use of the boat and net and other material. The price on the Columbia was sixty to sixty-two and a half cents a fish in 1881, the price having increased gradually since 1866 (and is still increasing). In the canneries about 850 white men are employed as superintendents, clerks, foremen, etc, earning from $50 to $175 a month, averaging $62. White men make the nets, cans, boats, and cases, and have all the capital used in the business. The 3,100 Chinamen receive $372,000 for their work of four months; the 850 white laborers in the canneries receive $210,000; the 2,500 fishermen, $850,000. The wages in the fishing season, and cost of fish paid by the canneries amount to $1,433,000; and of this 4,000 Chinamen get less than a third, while the 3,500 whites divide the other two thirds among themselves. The proprietors get $2,750,000 for the product, leaving them $1,316,400 above the cost of the fish and wages in the fishing season to pay other cannery expenses, interest on the investment, and profits.

Manufacture of Gossamer Rubber Goods.

A recent number of the *American Exchange and Review* says: "There is now largely used a very light description of waterproof goods, which, we believe, receives only one coat or layer of rubber mixture." In one rubber factory in Boston the rubber itself is ground up with a mixture of sulphur, whiting, and litharge, and is then rolled out into a delicate sheet, which passes under immense steel cylinders, and by them is pressed into the surface of cotton cloth, forming the material for men's waterproof overcoats. This process does not materially increase the hazard incident to the business, while the reverse is the case in the "very light description of waterproof goods," known to the trade as gossamer. Here the solution of rubber in naphtha is still further reduced by the addition of larger quantities of this dangerous product of petroleum, and in one of the gossamer factories most recently built the fluid is poured into an inking trough, from which it flows upon the spreading cylinders. As the cotton cloth passes under the cylinder in an endless roll, it receives a mere film of rubber, from which the naphtha evaporates before the web returns from the winding machine at the opposite end of the long hall. The proprietors report that the goods receive from five to seventeen spreadings, according to the grade of goods manufactured.

Necessarily, the air is impregnated with the fumes of naphtha, and the proprietors dread the lack of humidity in the atmosphere. To counteract this, steam is allowed to escape beneath the spreading machine, and live steam is also sent into the room from a perforated pipe, whenever the coldness of the air does not allow opening of the doors and windows. The saturation of the whole structure with naphtha vapor furnishes sufficient cause for the instantaneous spread of a mere spark through all portions of the structure. As an experienced manufacturer of caoutchouc goods has said: "You may select the best examples of rubber factories, and perhaps you will escape a fire; but no premium will pay for the risk where gossamer cloth is made." The manufacture of gossamer material into clothing does not seem very hazardous, but the careful agent will often find that the seams are made by the use of rubber cement, where again naphtha is the solvent, and even open pans of this volatile and dangerous fluid are in constant use by women and girls to "freshen" the edges of their work. The underwriter will find many risks of fine appearance offered to him, but he cannot afford to lose sight of the naphtha, or his underwriting will descend to gambling.

AT the Chicago Railway Exposition is an engine just built for the Southern Pacific Railroad, which weighs, with coal and water, 96 tons, and is designed for heavy service on unusual grades. On a level track it can draw all the freight cars that can be made to hold together by ordinary methods. Steam is required to work its reverse lever, aud the locomotive itself is a mountain of strength and mechanical construction.

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Correspondence.

The Elm Leaf Beetle.

To the Editor of the Scientific American:

With this I send you some "bugs" which suddenly appeared in myriads in our section of New Jersey, viz., Morris Co. Although an old resident, I have never seen anything like them before in our county. On my place they first appeared in a room elevated twenty-five feet, about fourteen feet square, and which contains a large water tank, which supplies my house and grounds. This room has been carefully closed during the winter, to prevent freezing of the water. Now, where did these insects come from?

From the water in the big tank? That seems to me to be impossible. The only water that goes into the tank is rain water, and through a large filter of charcoal and gravel. I think it hardly possible that they could have originated there.

Did they hibernate during the winter, entering during the warm months to remain torpid until the warm spring sun should bring them to renewed life? H. C. OHLEN.

P. S.—Should any of the "bugs" reach you alive, you will find them very lively. I have handled them freely and find that they are perfectly harmless.

I will suggest that perhaps they may be a new species of fire fly, or perhaps an unusual development of species already known. H. C. O.

New York, May 26, 1883.

Prof. Riley gives us the following reply:

The insect sent by your correspondent, Mr. H. C. Ohlen, of New York city, with his favor of the 26th ult., and which was found in large numbers in a room of a house in Morris Co., N. J., is the imported elm leaf beetle, *Galeruca xanthomelæna*, which is so destructive to our elm trees in the Atlantic States. It is possible that the specimens hibernated in the room where they were found, or they have entered the same lately; at any rate they certainly did not come from the water tank kept in said room. There are no doubt elm trees near by, and upon investigation the beetles and their larvæ will be found feeding upon the leaves. This pest seems to be more than usually common this season, and will no doubt do a good deal of damage to the elm trees if not checked by their natural enemies or by artificial remedies.

The species belongs to the family Chrysomelidæ, or leaf beetle, and there is an account of its natural history in the *American Entomologist*, vol. iii., pp. 291–292.

C. V. RILEY, *Entomologist.*

Washington, June 2, 1883.

RECENT DECISIONS RELATING TO PATENTS.

By the Secretary of the Interior.

In considering a foreign invention in its relation to an American invention, to determine the "first inventor," not the actual date of the former, but the date when it was patented or described in a printed publication, is the point to be kept in view.

In this connection the invention is patented in England, not at the date of the provisional specification, but when the completed specification is filed.

Testimony which would show a date of actual invention in a foreign country earlier than the date when the completed specification was filed would be immaterial in an interference.

By the Commissioner of Patents.

Where the only purpose of the reissue application is to broaden the claims, it must clearly appear that there was a mistake or error in the original preparation of the case, and that the applicant took immediate steps to have the same corrected.

By a failure to take immediate steps toward correcting a patent the patentee acquiesces in the terms of the grant and dedicates the invention to the public use. It has been intimated by the Supreme Court that they regard two years as the natural limit of delay in such cases in analogy to the provisions of law respecting the public use of an invention.

Chimney Flues and Fire Places.

The frequent destruction of buildings by fires caused by imperfect hot air flues, poorly constructed chimneys, and defective fire places impels attention to the lack of safe methods of building brick work in these portions of dwellings and other buildings. It has been found, by investigation after a fire has occurred, that carelessness, haste, or parsimoniousness on the part of the architect, the builder, or the owner, had been really responsible for the damage. There are plenty of recorded instances where fires have started because of the presence of a combustible in the chimney flue, as a flooring joist passing through the wall of the chimney and forming a part of the inner face of the flue. In one instance the builder's excuse was that the beam was on the upper floor and at least ten feet from a fire on the floor below, and was therefore out of danger. But a stove was placed so that its delivery flue came within eighteen inches of the exposed beam, and a fire was the ultimate result after an entire winter's charring of the beam.

There are instances of a division wall for a chimney flue being laid of only half a brick thickness—the brick width—and the mortar so carelessly applied as to leave chinks between the brick courses. The ledges and projecting ob structions left in unpargeted chimney flues afford inviting places for the deposit of soot and other light substances carried up with the smoke in its upward flight. Occasionally these accumulations take fire, and when a downward blowing gust occurs, the fine particles, all aglow, may be driven through the unprotected interstices of the unrendered brick wall to start a fire between floor and ceiling, or in the vertical space between plaster and studding.

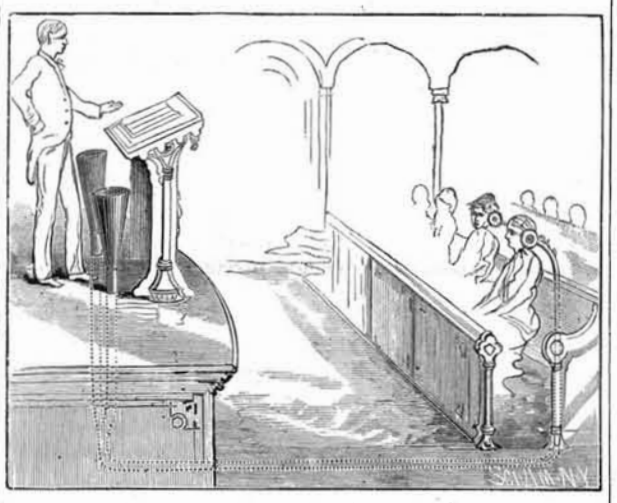
The Building News (English) takes up this matter of imperfect chimney building, and suggests, among other precautions, the lining of chimney flues with tubes of fire brick and the filling of the angles between the circular tubing and the square section of the chimney with solid brick work. To some extent this system is in use in this country, vitrified drain tile being employed for the purpose.

The News advocates the thorough pargeting, or plaster coating, of the interior of all chimney flues, where this fireproof tubing is not used, so as to stopup all possible crevices that may have been left by the carelessness of the masons. Chimney walls ought, also, to be carried up nine inches thick to a height of six feet above any fire, as the passage of heat through a brick wall is very perceptible, even if there is not a strong draught. Angles in the course of chimney flues should be of unusual thickness of brick, and be thoroughly plastered, as they present a face to the impact of the heated gases in their upward tendency.

Whatever other precautions are required, it is certain that wood or other combustible substances should not be brought in contignity with the chimney or the fire place. The present revival of the old fashioned fire place makes these cautions peculiarly significant. Quite recently the owner of a new house, which had a "low down" fire place for wood burning, discovered that the stone slab forming the fire bottom and hearth was supported on cross beams of spruce as a foundation, leaving only three inches, or less, of a heat conducting material between the fire and the wood. These conditions, so favorable to a destructive fire, were remedied at once.

MAKING THE DEAF TO HEAR.

The wife of a clergyman in New Jersey was recently provided with an apparatus whereby, for the first time in more than a score of years, she was enabled to hear her husband's



sermon. The perfect success which attended the experiment makes us think that others who are troubled with deafness might find the device very desirable.

Two cones of tin, about two feet long, fifteen inches diameter at one end and four inches at the other, were placed one on either side of the preacher's desk, the larger end up. A fine wire cloth covered the smaller end, and this end was extended down through the floor. Thence a four inch pipe, gradually diminished to three inches, extended to the cellar, where the two pipes were joined in a single one of three inches, and this carried a distance of thirty feet under the floor of the church. Here the three inch pipe was reduced to two inches, and extended upward through the floor and the seat of the pew. Another reduction in size to a diameter of one inch was here effected, and then a flexible tube connected it with a nickel plated ear piece at the proper height. The introduction of the wire cloth serves to obviate the roaring sound, which would otherwise be annoying. Our engraving is taken from the apparatus as arranged and recently put up in the church.

Labor and Food.

The human body never ceases to work. Even in the most profound slumber some of the functions of life are going on, as, for instance, breathing, the circulation of the blood, digestion, when there is food in the stomach; and it follows that some part of the nervous system is therefore awake and attending to business all the day and night long. In the act of living, some of the substance of the body is being constantly consumed. The amount of work done by the heart in one day in propelling the blood is now estimated as equal to the work of a steam engine in raising 125 tons one foot high, or one ton 125 feet high. We lose in weight by working. Weigh a man after several hours' hard labor, and he will be found two or three, and, in extreme cases, several pounds lighter. If we do not wish to become bankrupt, we must replace by food the amount we have lost by labor. Hunger and thirst are the instincts which prompt us to do this. They are like automatic alarm clocks, which stop the engine at various points to take on fuel and water. In a healthy man as much is taken in as is required to maintain the weight of the body against loss. Nature keeps the account. On one side is so much food spent in work; on the other, so much received into the stomach for digestion. They should balance like the accounts of an honest book-keeper. In an unhealthy person the instinct of hunger becomes disordered and does not sound the alarm, and so the person goes on working without eating until he becomes pauperized; or the instinct works too frequently, and he eats too much and clogs the vital machinery. A calculation of the business done in the body reveals the fact that for a hard working person about 8½ pounds of food and drink are used up daily; some bodies use more and some less, but this is the average. The profit which the body gets on this transaction has been calculated, and may interest our readers. The energy stored up in the 8½ pounds of food ought to raise 3,400 tons one foot high. Most of this energy, nowever, is expended in keeping the body warm and its functions active. About one-tenth can be spent in our bodily movements or in work. The profit, then, on the process is about ten per cent. This is enough to raise 340 tons one foot high each day. A profit which is quite enough for earning a good living if rightly expended, and it is probably more than most make; but all ought to strive to reach this point if possible.

The Basic Process.

The presence of phosphorus in iron is fatal to the conversion of iron by the Bessemer process, when it exists in any appreciable proportion. But by the basic process phosphoric iron is perfectly manageable. Its simplicity is one of its best features. Instead of a lining of silicious mortar, or paste, as in the Bessemer process, dolomite, or magnesian limestone, is used in the cupolas and also in the converters. Lime is added to the fused mass in the converters while the charge is undergoing its burning-out process. The basic process is in use in England, France, Germany, and Russia with excellent results. Germany has large deposits of ore, but the metal is so highly charged with phosphorus that they are valueless for conversion into steel by the Bessemer process. Yet by the basic process, Germany is producing about 350,000 tons of steel annually.

A correspondent of the *Industrial World* writes of experiments recently made near Harrisburg, Pa., in the production of basic steel. He says:

For the past three months the Pennsylvania Steel Company has been making arrangements with its old two-converter plant at the works near Harrisburg, Pa., to thoroughly test the value of the Thomas-Gilchrist process for the manufacture of steel, otherwise known as the basic process. The preparations were completed, and on the 7th of May last molten pig iron was run into the converter, and the first heat of basic steel ever made in the United States was a great success. The pig, which was made from equal proportions of mill cinder and Cumberland County, Pa., iron ore, contained 2½ per cent of phosphorus, 2½ per cent of manganese, and 1 per cent of silicon; and the basic steel contained only 0·04 per cent of phosphorus, 0·275 per cent of manganese, and 0·29 per cent of carbon. The samples of the basic steel that were tested gave results that were exceedingly satisfactory, and the steel from the heats that have subsequently been made showed that the quality of the steel was equal and, in a number of respects, superior to the steel previously made at the works by the Bessemer process.

That the basic process is cheaper than the Bessemer method is proved by foreign practice. In France basic steel can be produced nine dollars per ton less than Bessemer, and in England from four to five dollars per ton less. It is said, also, that at the steel works of La Creuzot, France, the basic process has been adapted to the open hearth furnace, with excellent results.

The bed of the furnace is made of magnesian lime stone and the roof is of silica bricks. A charge of phosphoric pig iron is introduced into the furnace, the furnace being heated in the usual manner, and common iron gradually dissolved in the bath. A quantity of lime is added from time to time, and the slag is removed with a rake. The silicon entirely disappears, and nearly all the phosphorus is removed. The operation lasts about twelve hours, and about fifteen tons of steel are produced.

Malaria.

The Italian Minister of War has published a statistical map, based on the official reports from the different provincial governments about malaria, by which the extent and the intensity of this disease can be estimated. Italy counts 69 provinces, 6 of which only are completely free of this pest; in 21 provinces its ravages are most severe. It has been calculated that more than 40,000 soldiers every year have to pay their tribute to this terrible scourge. Malaria causes to the State an annual expense of two million dollars through the necessity of maintaining a number of hospitals expressly for malaria patients. The damage to the national wealth cannot be calculated, but is immense; hundreds of thousands of working people in their best age are seized by the disease, and large tracts of else fertile country have to be left uncultivated. A very remarkable feature is the progress and the greater violence of the disease since the construction of railways, which circumstance is ascribed to the necessary earth-cuttings and the baring of stagnant waters. There are in fact some lines along which the strongest, healthiest workmen or officials stationed there are unable to resist the attacks of fever; the consequence is that the requisite working staff can be kept up with great difficulty, in spite of the exceptional high pay allowed to the men.

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A Cause of Boiler Explosions.

According to M. Treves, some occasionally mysterious explosions of steam boilers, when apparently in good structural and working order, may be thus explained: Supposing that work is to be suspended either for the night or for any long interval, after a stated hour, and that a boiler is commonly driven under an average pressure of 80 pounds or 90 pounds of steam; some time before the hour of closing, the stoker lets his fire slacken, fills up the boiler, and leaves off with perhaps 50 pounds or 60 pounds on the gauge. Next morning, or after the interval, he finds the pressure gauge standing at 20 pounds or 30 pounds, with a good supply of water. Consequently, in order to save the heat stored in the boiler, he begins to fire up, without thinking of the danger which may lurk in the water that has been boiling all night. The stoker never thinks of putting in more water, because the gauge is all right, and thus prepares the essential preliminaries of a "mysterious" explosion.

The water that has been standing above the boiling point for hours has lost its power of ebullition, because the air which it formerly contained has long been driven off; and in this dead condition it is capable of absorbing heat without the power of delivering it up in the form of steam. The water thus becomes superheated, and at the moment of any mechanical agitation—such as the opening of the steam valve, or the introduction of fresh water—it may instantaneously flash into steam with explosive force. It has been abundantly proved that, apart from gross defects of construction, condition, or management, superheating of the water has of late years been the only intelligible cause of the greater number of boiler explosions. The remedy for this danger is fortunately simple, and resides in the employment of any effective means for preventing the "sleep" of water in boilers by keeping up a constant ebullition.

A good device for this purpose is to prolong the water feed pipe by a T; the horizontal branch being about 6 inches above the bottom of the boiler. The under part of this tube is to be provided with open conical nipples ranged along the whole length of the pipe, which will extend from end to end of the boiler. Before firing up, therefore, the stoker should force air through the feed pipe so fitted until a pressure gauge on the pump shows a higher reading than the quiescent steam gauge. The nipples are then full of air, and ready to act as the generating centers of ebullition, whereupon the fire may be pushed as briskly as desired without risk of explosion. This suggestion emanates from MM. Donny and Gernez, and is recommended by M. Treves as an economical embodiment of a universally accepted theory.

A QUADRICYCLE FOR LAND AND WATER.

The accompanying engraving represents an ingenious vehicle for traveling by land or water, recently patented by Mr. H. S. Blanchard, of Cairo, Ill. The inventor has chosen the form of a swan as being the most graceful and appropriate for the purpose, although he does not confine himself to that form. A light frame work of wood or iron is covered with sheet metal, waterproof canvas, or other material. From the body of the vessel arises a standard supporting an awning which, by means of adjustable guys and a ball and socket joint, may be fixed at any angle to be used either as a shelter from the sun or storm, or as a sail.

But the principal means of propulsion are paddles and rotating floats worked by the feet of the rider, who sits on a seat forming a part of the steering lever or helm. From near the top of the standard, curved arms project outside of the vessel, having suspended and supported on the water ellipsoidal floats which steady the vessel on the water and aid in supporting it on the land. As a protection from injury the floats may be surrounded with wire netting, as shown in the engraving. These floats, as well as the vessel itself, are filled with cases of cork or other buoyant material to insure floating even if the outer case is injured.

Propulsion is secured by the action of hinged floats connected with a platform treadle which carries cone floats, to the rear ends of which the operating paddles are hinged. As the platform is rocked is one direction the cones are advanced forward, the paddles floating horizontally. By the reverse motion the paddles turn against the broad ends of the cones and present their surfaces to the water. A double crank shaft may also be connected with the foot platform and treadle, so as to rotate floats at either side of the vessel as another means of propulsion.

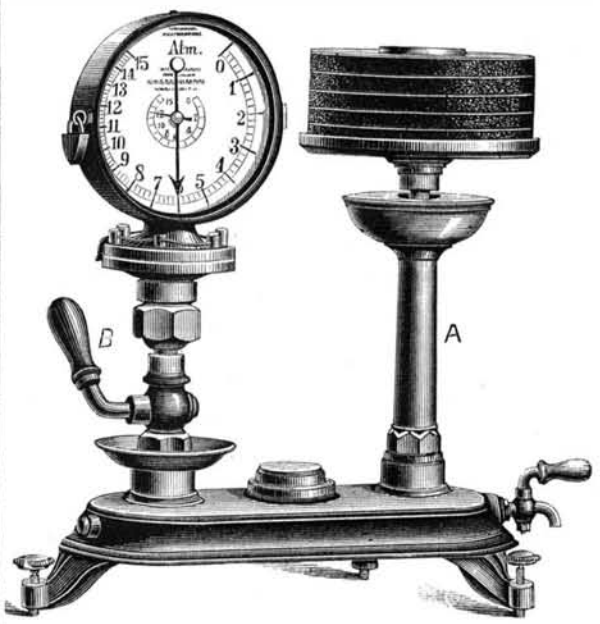
If the vessel is to be moved on land the buoys may serve as supports and as wheels; or the outer ones may be removed and those connected with the crank shaft be used as a means of propulsion, the buoy in front being used as a guide wheel.

BLANCHARD'S QUADRICYCLE.

A RAILROAD was opened last month between Tiflis, the capital of Transcaucasia, and Baku, one of the ports on the Caspian Sea. It is intended to connect this last with the Black Sea. This road reduces communication from five days to fifteen hours between Tiflis and Baku. It is the greatest commercial achievement yet of Alexander III.'s reign.

PRESSURE GAUGE TESTING APPARATUS.

The use of standard pressure gauges and pumps for testing and adjusting other gauges and dividing the dials exactly has several inconveniences. Pumps are difficult to keep in good order and to start, if they have been for some time out of use. The standard spring gauges employed for controlling others may become incorrect, and often indicate different pressures when two of them are placed beside each other on the same pipe. Mercurial gauges are certainly the most accurate instruments for measuring pressures, but can-



PRESSURE GAUGE TESTING APPARATUS.

not be used for high pressures on account of their very great height. They have become already inconvenient for the present medium pressures, without taking into account that the friction of the mercury, which increases with the pressure, necessitates a calculation in order to obtain the correct indications. These inconveniences have led Mr. Ruchholz to design the testing apparatus represented by the illustration with a view to remedy them. One person is sufficient to work it at any time, while the space occupied is small, and the employment of a standard pressure gauge for the purpose of comparison is avoided, the pressure on the spring of the gauge to be tested being produced by dead weights acting through the medium of a suitable liquid, such as pure glycerine.

The apparatus consists of a base which contains a pipe that connects the two uprights which rise from it, and are also hollow. A is a cylinder bored true internally and receiving a steel piston ground to fit. The cock, B, is threaded to receive the gauge to be tested.

The piston carries a tray, on which weights can be placed, and is so proportioned that a pressure of one atmosphere per square inch is given by the piston itself, while each weight represents an additional atmosphere. When used the apparatus is placed upon a firm table and adjusted by the set screws in its feet till the cylinder occupies a perfectly vertical position, which is indicated by the spirit level fixed upon the middle of the base plate. After taking the piston out, glycerine is poured into the cylinder till the liquid flows out of the upper end of the cock, which is left open, when the gauge to be tested is screwed on, and a further certain quantity of glycerine poured into the cylinder. The apparatus having been thus filled, the piston, which must be kept perfectly clean, is inserted into the cylinder. The pointer of the gauge must then indicate one atmosphere, and maintain its position while the piston is lightly rotated, this rotation being necessary in order to annul the slight friction of the glycerine against the inclosing surfaces. The weights are then gently placed upon the tray, and the latter is each time rotated in order to obtain the exact position of the pointer.

If the piston should come in contact with the bottom of the cylinder after a certain time, or before the desired pressure is obtained, the cock, B, is closed in order to keep the gauge at the pressure prevailing at the time. The weights and piston are then drawn out so that a further sufficient supply of glycerine can be poured into the cylinder. When this is done, the piston is reinserted, and the same number of weights placed on the tray as when the cock was closed. The latter is then opened, and further weights may be placed on the piston. In this way very high pressures can be obtained.

When the testing or dividing of the dial is finished the disks are gradually removed and the piston withdrawn, and when the pointer has arrived at zero the cock is closed and the gauge unscrewed. The glycerine is finally drawn off by means of a small tap placed at one end of the base plate.

Colored Varnishes for Tin.

The *Gewerbeblatt* gives the following: Thirty grammes of acetate of copper are ground to a fine powder in a mortar, then spread out in a thin layer on a porcelain plate and left for a few days in a moderately warm place. By this time the water of crystallization and most of the acetic acid will have escaped. The light brown powder that is left is triturated with some oil of turpentine in a mortar and then stirred into 100 grammes of fine fatty copal varnish warmed to 60°R. (16·7° Fah.). If the acetate of copper was exceedingly fine, the greater part of it will dissolve by a quarter hour's stirring. The varnish is then put in a glass (bottle) and placed for a few days in a warm place, shaking frequently. The small quantity of acetate of copper that settles can be used in making the next lot.

This varnish is dark green, but when applied to tin it requires four or five coats to get a fine green luster; but two coats are sufficient, if it is heated in a drying closet or on a uniformly heated plate, to produce a great variety of shades of gold. A greenish gold, a yellow or dark yellow gold, then an orange, and finally a reddish brown shade is obtained according to the time and temperature. The colors are superior in brilliancy to those obtained with the English gold varnish, and have the advantage of permanency in the light. If a good copal varnish is used in making this polychromatic varnish, or lac, the tin can be hammered or pressed.

The production of golden colors depends on the reduction of cupric oxide to cuprous oxide (protoxide to suboxide), which, in small quantity, dissolves in the copal varnish with a golden color. The more the heat the greater the reduction, and hence the darker the color. Success depends on applying it evenly and warming uniformly.

Time by Telegraph.

Mr. James Hamblet, Manager of the Telegraphic Time Service in connection with the Western Union Telegraph Company of this city, has patented an improved method of synchronizing clocks, and he is now prepared to furnish clocks with the apparatus included, and correct them each and every hour by signals from the standard clock of the Time Service, from which the signals are transmitted to all the principal watch makers and others in this city.

The problem of correcting clocks throughout cities and towns by electricity has been heretofore supposed to be unattainable; by Mr. Hamblet's system, with a good clock at a central station, provided with the proper mechanism to send a single beat not to exceed one second in duration, exactly at the beginning of each hour, and inexpensive clocks located in places within convenient reach of a local system of telegraph wires, a successful distribution of uniform time may easily and cheaply be maintained.

The clocks that are used for this purpose may independently be regulated to run within a minute or two in a week, and when we remember that the clocks are corrected each hour, making 168 parts into which the two minutes are divided, it will be seen that correct time can easily be assured.

For some time past we have had in operation in the SCIENTIFIC AMERICAN office one of Mr. Hamblet's clocks, which is connected by telegraph as above indicated, and the improvement gives us much satisfaction.

THE Italians propose to have a world's fair of their own next year in Rome.

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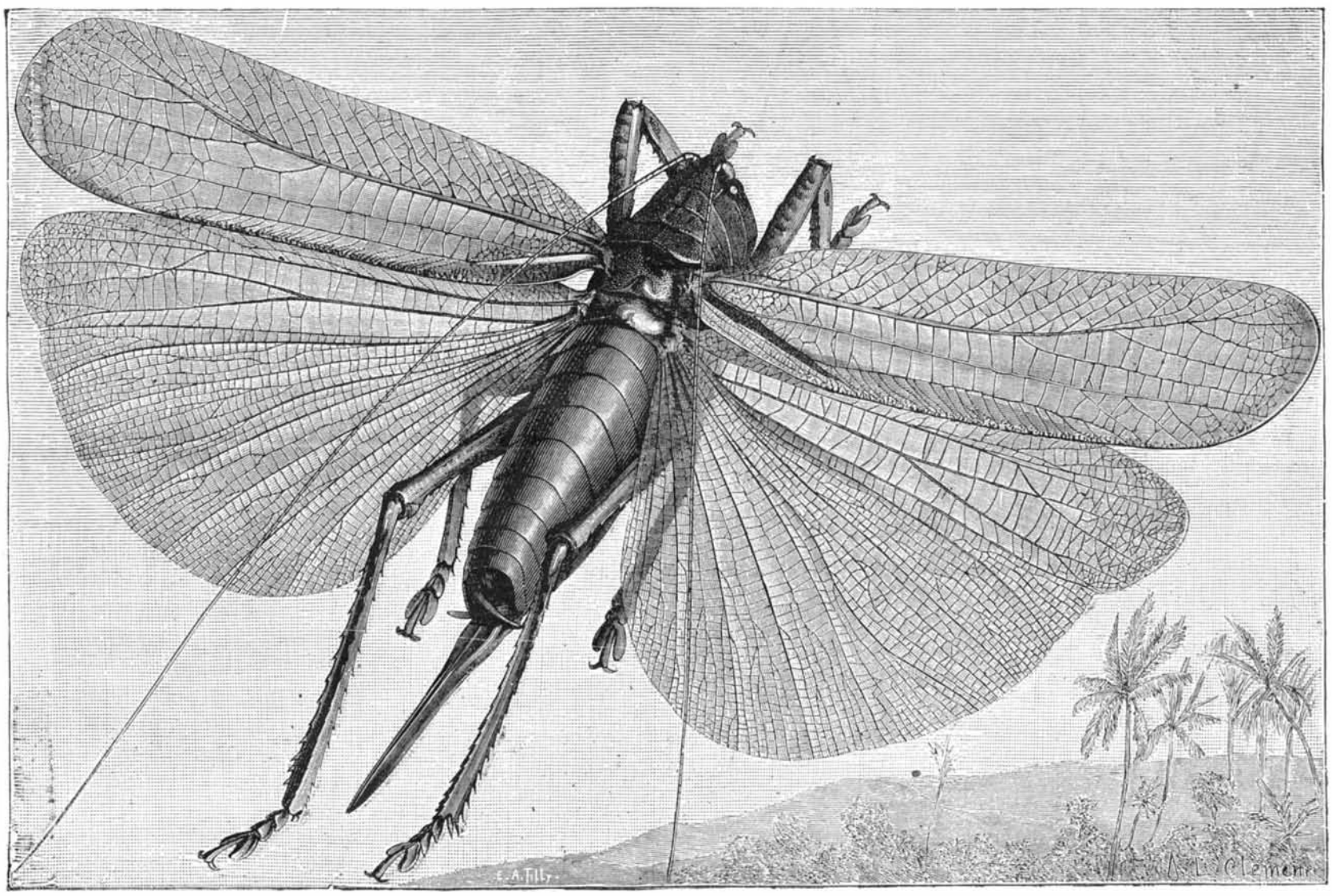
THE GIANT LOCUST.

There is no doubt that the order Orthoptera contains the strangest formed and the largest insects. We know, in fact, that the largest of all known insects is an orthopter belonging to the family Protophasma, and found in a fossil state in the coal schists of Commentry. This gigantic articulate, of the Carboniferous epoch, which was 28 centimeters (11 inches) in length, has recently been described by Mr. Charles Brongniart under the name of *Titanophasma fayoli*, the specific name having been given in honor of Mr. Fayol, directing engineer of the Commentry mine, and a gentleman to whom entomological palæontology is indebted for many valuable discoveries. The species living in our day, although of smaller dimensions, are nevertheless of very respectable size, as may be seen from the accompanying cut, which gives a faithful representation of a female *Platyphyllum giganteum*, or giant locust of New Caledonia. The genus *Platyphyllum* (from the Greek πλατύς, "wide," and φύλλον, "leaf") belongs to the group of leaping orthopters and to the family Locustidæ. It embraces insects that are remarkable for the size of their wings (the upper ones of which resemble green leaves), and includes several species native of North America, the Antilles, and South America.

The giant locust is green, has long antennæ, and its lower wings are in part transparent. It lives, it appears, at the top of palm trees, and is rarely met with elsewhere, and this makes hunting for it difficult. It has only been well known since the return to France of exiles from New Caledonia, who had captured a certain number of specimens of it. If we compare these enormous insects with their representatives in our own regions, we shall be astonished to see how small are the dimensions of the latter. Instead of giant locusts, we have our green grasshopper (*Locusta viridissima*), which may be seen flying in the fields and woods during fine weather, and the length of body of which does not exceed 4 centimeters, even in the largest individuals. This grasshopper is common in the environs of Paris, where the vulgar call it the *Cigale*, a name belonging to a singing insect of the order Hemiptera. The male sings his sharp and sonorous song in the evening. The female may be easily distinguished by the presence of an ovipositor, by means of which she deposits six elongated whitish eggs in the ground toward the end of summer or in autumn. In the spring there issue from these eggs small grasshoppers that resemble their parents but are devoid of wings, these being acquired after successive moultings. Our indigenous insects are, it is true, not so curious, not so large, and not so beautiful as those of tropical regions, but, as an offset, we can study them in detail, in their different stages, and make known their habits (which are often interesting) instead of limiting ourselves to a simple description, without any biological information, as we have just been obliged to do with regard to the giant locust.—*La Nature.*



GIANT LOCUST OF NEW CALEDONIA.—(NATURAL SIZE)

ALTHOUGH Russia has vast beds of excellent coal, she imports nearly half of what she uses—chiefly through lack of internal communications.

Agricultural Notes from Italy.

The black truffle at times is worth almost 150 francs (30 dollars) for 1 kilogramme (2·2 lb.), and in spite of all the expensive investigations made as to its growth its artificial reproduction has not been successful. It now appears, according to the *Gazzetta della Campagne*, that thet ruffle is an analogous product to the gall nut, with the difference that the gall nut appears upon the leaves and the truffle upon the roots. A little insect with blue wings appearing in certain districts during the months of July and August buries itself in the earth and stings the rootlets of the oak in depositing its eggs within them. Around this strange nucleus an excrescence arises which we call a truffle. Arriving at maturity, the egg opens, the larva emerges, and remains as a chrysalis until spring time, when it is transformed into a fly with blue wings and provided with the power of reproducing, by the same means, the coveted morsel. This accounts for the failure of attempts to plant truffles, and why they are only found in certain places and only in the oak. We have also in this an explanation of the poverty of the truffle harvest when the months of July and August are dry, the hardness of the ground not permitting the insect to make its way to the buried rootlets.

Hothouses are being widely introduced into Italy. In these generally the air is heated, which again warms the earth. A Turin inventor, M. Cirio, has reversed the procedure and has run hot water through the earth which he wishes to warm. The hot baths of Acqui are supplied by a hot spring. After the various purposes of the establishment have been served by it, this water still retains a serviceable amount of heat. M. Cirio has made at the side of the baths a garden inclosing 500 square meters, and by means of earthenware pipes has made the water leaving the baths to circulate under the ground in all directions. He has planted 10,000 asparagus roots, 4,000 chiccory, and 4,000 plants of Roman lettuce, besides strawberries. In passing it may be said that the Japanese have adopted similar methods; the waters of hot springs about Tokio are about to be experimented with in a similar way, and the volcanic heat of certain districts in Japan is also to be utilized, by conducting the heated air from subterranean wells and bringing it to the surface.

The sugar sorghum has been cultivated with success in Italy, but the high duty or rather government tax has so entirely swept away any possible profit that it is being abandoned.—*L. T. G., in Les Mondes.*

Insects as Food for Man.

Mr. Max Buchner's "Contributions to the Ethnography of the Bantus" contains the following interesting notes, which show that insects are by no means despised as food by this tribe of negroes, which inhabit a large portion of Southeastern Africa. Toward the end of the rainy season, in April, when the white ants are swarming, the conical buildings of these insects are covered with a dense matting of banana leaves, while, within this cover, vessels are placed with funnel-shaped entrances. In these vessels a large number of white ants, males and females, are caught and roasted on the spot. They are considered a great delicacy, even Mr. Buchner finding them very palatable. A large, fat, subterranean cricket, as well as a large coleopterous larva, living in hollow trees, are equally sought for and roasted over fire. But it is especially a large caterpillar called "ugoungoo," which is harvested by the natives like a field crop. It is about five centimeters long, black, with yellow rings, occurs on the savannas, and "belongs perhaps to the butterfly Crenis." Whenever it appears in large numbers, the negroes march out in full force from their villages, camping out for weeks in the wilderness to gather and cure the crop. After the intestines have been pressed out, the caterpillars are dried before the fire and rolled up in packages of fresh leaves. To a civilized taste they are most disgusting, the smell reminding one of that of our cabbage worms. In view of this custom it seems to be strange that the Bantus refuse to eat snakes and amphibia of all sorts, even frogs and lizards not being touched by them in times of starvation.—*The American Naturalist.*

Explosions in the Production of Ozone.

A mixture of equal parts of binoxide of manganese, permanganate of potash, and oxalic acid constitute Lender's powder. It is used for the generation of ozone in bedrooms. A well known pharmacist of Paris made up the above mixture. Five minutes later it exploded spontaneously. The next explosion we describe was a more dangerous one. Some Germans had recommended ozone for the treatment of croup. An apparatus was tried in which ozone was produced by the action of sulphuric acid on permanganate of potash. The experimenters, two scientists of Paris, had placed the apparatus in a cabinet away from the general laboratory, knowing there was danger. Every possible care was taken to avoid an accident. The apparatus had worked quietly for some minutes, when the experimenters went to procure some iodide of starch paper, the ozone reagent. They were but six feet distant and with their backs toward the apparatus, when a terrific detonation took place, deafening them by the violence of the sound. The generating flask completely disappeared and the acid was scattered right and left. The probable explanation of the trouble is that some organic matter from the corks of the apparatus was introduced into the permanganate. It is also suggested that the sulphur of the rubber connections played a part in the explosion.

A method for the production of oxygen at ordinary temperatures has during the last few weeks been quite extensively circulated by the scientific press. It consists of a treatment of solid permanganate of potash with concentrated nitric acid. This mixture liberates oxygen in considerable quantity, and to evolve the last portions a gentle heating of the mixture is advised. The extreme danger of this experiment is well illustrated by the ozone explosions we have just described. The danger would be great enough normally, but is increased by the subsequent recommendation to heat the mixture.

S. T.

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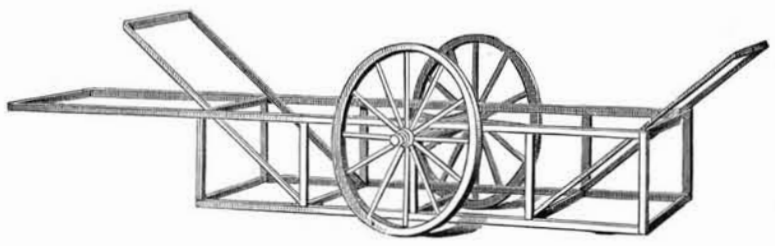
FARM HAND CARTS.

There are many occasions when a wheelbarrow is too small, and a larger hand cart will answer the purpose and save the hitching up of a team to a wagon. A farm cart can be made at a very small expense after the plan shown in the accompanying engraving, which we transfer from the *Farm and Fireside*. There is very frequently an old pair of wheels that have outlived or outlasted the other parts of the wagon, and will serve an excellent purpose for the running gear of the farm cart. If the cart is to be mostly used for drawing coarse material, like straw, hay, green fodder, etc., the body should be low for the greater convenience in loading and unloading, and increased ease and safety in the transfer.

The engraving shows how a rack can be made so that the load is brought down to a low and handy point. The frame may be eight feet long, three feet wide, or any other size desired, with a depth depending upon the size of the wheels.



The bottom of the frame should be a few inches above the ground. The engraving gives only the frame with the end wings on for drawing coarse material. The side wings are for covering the wheels, and may consist of bent half poles of hickory, fitted into arms placed to the front and rear of the wheels, much in the same way that the hind (and sometimes the fore) wheels are protected in the common low, or flat, hay rigging. If a tight box is needed, it can be made of light stuff, and either permanently attached to the frame or placed in the frame as the work requires it.

A hand cart upon the farm, or for use in gathering leaves and conveying newly mown grass from lawns, is very useful. The simplicity of the device renders it easily made by any unskilled person, and it will be found a handy implement for many other uses than those named about a gentleman's place. It costs but little, and saves much time and labor. There should always be a wheelbarrow and a hand cart on every well regulated farm.

Carding and Bleaching of Ramie.

The society for promoting the ramie industry in France has approved of the decorticating machine of Messrs. Labarie and Berthat. By it the difficult problem of separating the ligenous matters from the fiber has been solved. The invention of a method of preparing the fiber for spinning remained, and this appears to have been made by M. Scheifner.

The fiber is placed upon a horizontal endless band, which carries it to a pair of fluted drums. These distribute it to a cylinder, which is covered with teeth, about 3 millimeters in diameter, and 3 centimeters long. Then it passes another cylinder, having teeth, 1½ millimeters in diameter and 20 millimeters long, and then to the third yet smaller. Between the cylinders and above them small rollers, covered with carding, direct and maintain the fiber. The motion of the cylinder increases in rapidity from the coarsest to the finest in the proportion 10, 20, and 40. Two fine roller-cards deliver the fiber to a drum containing a system of jaws, operated by eccentrics and cams. An intermitting rotary movement is given to the drum, and when it stops, the pair of jaws opposite to the latter of the small cylinders seize and close on a portion of the fiber, which they submit to the action of a card drum making 50 turns a minute. This mechanical combing is so repeated on a pair of adjoining and similar drums that the portions of the fiber which have been pinched by the jaws are now combed. The fiber is again carded and run off in a continuous band. To remove the mucilaginous and ligneous portions which still remain, the fiber is steamed with the vapor of water acidulated with hydrochloric acid. This operation is followed by a bath at a temperature varying from 80° C. to 120° C., containing from 5 to 10 per cent of carbonate soda made caustic by lime. Then follows the bleaching, which comprises four distinct operations:

1. Make a bath of four times the weight of the fiber, containing 10 per cent chlorinated lime and 5 per cent hydrochloric acid. Enter and steep for from fifteen to thirty minutes.

2. Make a bath of eight times the weight of the fiber, containing 10 per cent of Epsom salts; the chlorine remaining from the last bath will combine with a portion of the magnesia; this compound will assist in the bleaching without acting injuriously on the fiber.

3. Make a bath containing 5 per cent carbonate of soda, and enter fiber, in order to convert the magnesian salt into the carbonate.

4. Neutralize any remaining chlorine by the action of sulphurous acid.

After bleaching, pass through bath of carbonate of soda, and then through bath of dilute hydrochloric acid, which serve to divide the fibers very finely, and give them the luster of silk. Finally, to increase their flexibility and softness, make use of the following soaping:

Soap two parts, carbonate of soda half part, water 100 parts, brought nearly to a boil. For the same purpose exposure to the vapors of glycerine is sometimes preferred.

Houses and Homes in the Great City.

The population of New York city is now nearly 1,500,000, and for dwelling purpose in whole or in part there are said to be 78,368 houses. Of these 49,565 are exclusively occupied as dwellings. The total number of families is 200,000, and of this number only 32,100 own their houses. The remainder pay rents. Within a comparatively brief period large numbers of what are known as apartment houses or flats have been erected. For the most part they consist of large buildings about 50 feet wide, 90 feet deep, and 6 stories high. Through the center is a hall and stairway. On each side of the hall way on each story, the space is occupied by a series of connected rooms, small in size, ordinarily intended to consist of a parlor, kitchen, dining room, bath room, and three bed rooms, with sundry closets. These apartments, collectively called "a flat," are cramped and contracted, affording but a limited amount of light and air. The rentals run from $30 to $70 per month, depending upon the location of the building.

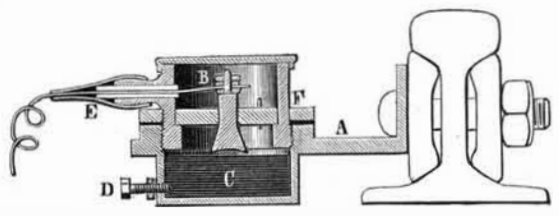
For better flats the rents are from $100 to $500 per month; for the latter sum large and superior apartments, in a ten story fireproof building may be had, with passenger elevator, etc. For entire dwelling houses, of 3 or 4 stories, with 9 to 13 rooms, the rentals vary from $600 a year to $3,000; the finer houses costing much more. The opening of the great bridge between New York and Brooklyn will, it is supposed, be of great advantage to the working people of New York, by enabling them to secure new and comfortable homes at moderate prices, without the necessity of the close crowding to which they are now subjected. Brooklyn has an unlimited area, it is supplied with horse cars running in all directions, and families of small means may rent full dwellings there for less money than they pay in New York for narrow and confined apartments.

ELECTRICAL RAILWAY SIGNALING.

We know the difficulty of making a good electrical contact when it is to be worked by a train running at a high speed, and that this contact is exposed to all kinds of atmospheric changes with scarcely any attention. It is to meet the requirements of a contact of this kind that M. L. Mors has invented the contact represented below, of which the principle and disposition are easily understood by reference to the description which accompanies the figure.

It consists in utilizing the vibrations produced by the passage of the train upon the rail to which it is fixed, to produce, by the movement of the mercury, a contact, in a hermetically closed space, which continues during the passage of the train. The contact works any apparatus whatever—bell, signal, disk, etc.

Experiments made upon the Paris-Lyon-Mediterranean line have given satisfactory results. The apparatus may be applied in any case where it is required that any mechanical vibration shall cause automatically a corresponding signal.



A. Lever, bent at the end to be riveted to the fish plate.

B. Contact cone, insulated from the iron box by a piece of ebonite or wood, upon which is a small plug, which is removed to replenish the mercury in the cup, if necessary. The large surface of the cone is about 2 mm. from the surface of the mercury in a state of repose.

C. Cup containing mercury. This cup communicates with the rail by the lever, and forms the "earth" pole (copper or zinc, according to position).

D. Small screw for regulating height of mercury, also for emptying the cup.

E. Nipple, through which is forced the junction cable, covered with a thick India-rubber tube; upon this tube is placed another tube, which covers the nipple in such a manner as to form a hermetically closed joint.

F. Iron cup containing mercury.—*Electrical Review.*

Fool's Gold.

As every substance has its shadow, everything genuine an imitation, it is to be expected that gold itself, the king of metals, should have its counterfeits, natural or artificial. Leaving aside the latter class, from time immemorial have men been deceived by those of the former, that is, in mistaking *other minerals* for gold.

A farmer's lad, slowly wading through a little stream, looks down into the water, and there, brought into view by the sparkling rays of the sun, he sees something glistening and shimmering so brightly that, seized by sudden curiosity, he runs his hand through the bed of the brook and brings up a handful of sand interspersed with shining yellow specks, and, behold, he has found gold! So he fancies, and the wonderful discovery is noised far and wide. A sample is quickly sent to some expert, and the report is, *mica in sand.* But who can blame the infatuated, self-deceived rustic? It looks like gold to him, and his castle in the air rises higher and higher until the rude fiat of the one who *does* know dashes it to the ground.

It is not so long ago that a pill-box containing an ounce or more of this mica bearing sand was sent to me to ascertain its value; and the sender was exceedingly disappointed when I informed him of its worthless character. And to-day I preserve some of it in my cabinet to show my visitors, and when the question is asked of each as to its nature, nine out of ten promptly reply that it is gold. Then, as a short, practical lesson in mineralogy of this metal, a second bottle, containing sand carrying the genuine article is brought out, and the difference is seen at once.

What assayer, mining engineer, mineralogist, or metallurgist has not had the same experience?

But mica is not the mineral that has done the most harm. Pyrites of iron and copper (copper pyrites or chalcopyrite), and pyrites of iron, the "fool's gold," have misled thousands.

In general appearance, this "fool's gold" is not so very unlike the true gold, that is, when the latter is not directly compared with it. It has a bright, yellow, metallic luster on the surfaces of unoxidized pieces and the interiors of freshly-broken pieces which are decomposed on the outside.

In 1608, about the time of the first settlement of Virginia, the colonists "believing that they had discovered grains of gold in a stream of water near Jamestown, the entire industry of the town was directed to digging, washing, refining, and loading gold; and notwithstanding the remonstrances of Smith, a ship was actually freighted with the glistening earth and sent to England" (*Willson's American History*). Whether this glistening earth was mica or minute pyrites in the clay or sand, history does not tell us, but presumably the latter, since it is found to a considerable extent throughout that State.

From that time down to the present, the mistake has often been made, *not* of imagining the pyrites to *contain* gold, but that it *is* gold.

There is probably no other metalliferous mineral more widely distributed than iron pyrites. It is found in rocks of every age, and almost in all parts of the world. Hardly a State or Territory of the United States but contains it to a greater or less degree, hence the great prevalence of the error concerning it.

To illustrate: a colored man in Mississippi mailed me a lump of this mineral, water-worn into a rude semblance of a gold nugget, and desired me to sell it for him! All I could do was to tell him of its worthlessness, and instead of a piece of gold worth $40 to $50 as he supposed, it was, in fact, not worth the postage paid on it.

To come nearer home: from two separate places in Michigan, and from two different counties in Wisconsin, has the same mineral, with the same question, been sent me, and lately an intelligent-looking gentleman brought me three or four pounds of this same delusive stuff, picked up on the shores of our lake, twenty miles north. It is needless, perhaps, to say that they were all disappointed in their great expectations.

From all that I have written there can as surely be deduced a moral as it can from the history of any nation, race, or sect, or life of any eminent individual, and the moral is, *a more practical education in all of our schools.*

I do not refer to those institutions which make a specialty of teaching geology, mineralogy, metallurgy, assaying, or other branches of science, but to the average, the common schools, for it is in such that the majority of our people obtains all it knows of books and learning. It should be as imperative for the scholar to know a lump of coal from a piece of iron ore, to be able to distinguish a copper ore from one of lead, to learn the difference between granite and limestone, between "fool's gold" and real gold, as it is for him to learn that six and seven do not make eleven or that the wonderful English language is capable of pronouncing *rough* as *ruff* and *bough* as *bow!*

It is not necessary to make of the youth whose entire school education is acquired in one or two years, an expert mineralogist—there are limits to all things—but simply to know more of the material things, such as he is likely to, meet with in his every day life.

To give a point to my moral and to return to my subject, let the one who finds something bright and *yellow* and imagines it to be gold try to cut it (if it be large enough to handle) with his knife. If it cuts easily (somewhat like lead) and flattens by use of hammer and anvil, it probably is what it is thought to be, at all events it is worth investigating. If, on the contrary, the specimen is too hard to be cut (iron pyrites), or crumbles instead of being sliced (copper pyrites), it certainly is *not* gold. Finish the test by placing some of the suspected mineral, powdered, in a common iron spoon over a fire. If, when it has been well heated, fumes arise and a smell as of a burning match is perceived, then pyrites is present, for it is the sulphur leaving the iron (or iron and copper) with which it was united to form the pyrites that causes the fumes and odor.

In conclusion, let the enthusiastic seeker of the precious metal remember the ancient but wise adage that "All is not gold that outward shewith brighte."—*Walter Lee Brown, in Mining Review.*

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RECENT INVENTIONS.

Improved Bag Holder.

We give an engraving of a new device for holding a bag raised and open while it is being filled. The bag holder is formed of two curved arms provided with hooks, the arms being attached to toothed disks resting against another toothed disk on the upper end of a rod which is supported by a forked brace, the latter being driven into the ground or into some post or wall. The several toothed disks are pressed against each other by a screw passing through them. By this means the curved arms can be adjusted to hold bags of any desired size.

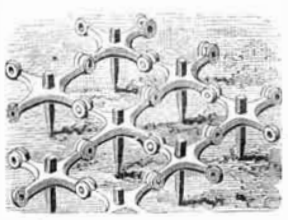
This invention has been patented by Henry W. Nelson, of Ord, Neb.

Shield for Shirt Studs.

The object of this invention is to provide a device for preventing the screws or spirals of shirt studs from irritating the skin and cutting holes in the underwear. The invention consists in a shield, into which the screw or spiral of the stud can be screwed after having been passed through the aperture in the shirt bosom. This shield is preferably constructed of two disks secured to each other at the edges, one of the disks being provided with an aperture, through which the screw of the stud can be passed. This useful device is the invention of Mr. Daniel W. Wilkins. All communications in regard to it may be addressed to Noyes Brothers, 4 Summer St., Boston, Mass.

Improved Harrow.

This is a novel arrangement of the harrow frame in separate sections, which are jointed together so as to enable sections to be added or detached for increasing or diminishing the size of the harrow; also for changing its form as may be desired, each section being preferably constructed for one tooth, and consisting of a center and four arms radiating from it for jointing with the other sections, the joints being interchangeable, so that any section may be added to any others. Beside enabling the harrow to be varied as to size and shape, the teeth will conform to the surface of the ground better and do better work, and by making the sections in cast iron or steel the harrow can be made very cheaply. This invention has been patented by Mr. Joel A. Thronson, of Dayton, Washington Territory.



Improvement in Trays.

The annexed engraving shows an improved tray on which articles can be carried without danger of their sliding off, and without requiring the use of both hands while carrying. An oval or circular tray is provided with wings, to which handles or bails are hinged, and the latter are curved in such a manner that when they are folded down they rest on the rim of the tray. The hinges of the bails or handles are provided with stops to prevent swinging them upward or outward too far beyond the vertical position. While carrying the tray, the highest points of the handles or bails are to be swung in contact, so that the tray can be carried and held by one hand, leaving the other free to open doors, etc. The rim prevents the dishes and other articles on the tray from sliding off in case the tray is accidentally inclined. The tray can be used in dining rooms, sick rooms, etc. When the handles or bails are swung down, they cross each other. The rim of the tray is about one inch high. In place of making the tray oval, it can be made circular; but the oval shape is considered preferable. This invention has been patented by Sara L. Vreeland, of Hackensack, N. J.

Improved Pipe Wrench.

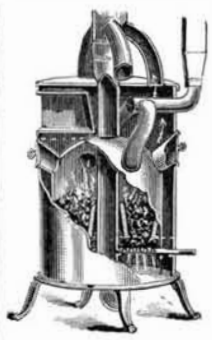
The annexed engraving shows a simple and very effective pipe wrench patented by Mr. C. C. Coleman, of Honolulu, Hawaii Island. In this wrench the serrated jaws are pivoted together, the larger one being pivoted to the lever handle and forming a fulcrum for it, the smaller one being connected with the short arm of the lever by a link. The mechanical arrangement is such that any increase of pressure tending to turn the pipe insures a firmer hold of the jaws on the surface of the pipe.

Protector Attachment for Electrical Conductors.

The engraving shows an improved device for preventing the stretching or breaking of electrical conductors while being introduced into or removed from their inclosing tubes, and for removing the conductors from their tubes should they become severed. The improvement consists in attaching to the conductor, by a wrapping of wire, a spirally wound wire or clips, a straight wire having a protective coating of gutta-percha or other suitable material, and of sufficient strength to be used in introducing the conductor into or removing it from its tube or casing. This device will render it a simple matter to remove and replace any conductor; it will also greatly facilitate the construction of underground lines. Further information in regard to this useful invention may be obtained by addressing the inventor, Mr. William E. Townsend, Jr., 30 So. Elliott Pl., Brooklyn, N. Y.

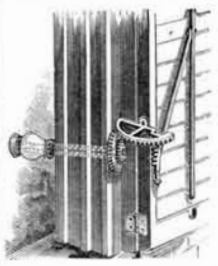
Combined Heater and Oven.

This device is formed of a vertical drum or cylinder made of cast or sheet iron, and provided with a central cast iron tube extending through the drum and projecting from the top and bottom, the lower end of the pipe being curved. An annular firebox made of cast iron and provided with a dome is contained in the lower part of the drum, and the pipe passes through this firebox and dome. The bottom of the firebox is a sufficient distance above the floor of the drum to form an ash-pit. The grate rests on an annular projection of a short cylinder surrounding the pipe in the ashpit. A baking oven is arranged in the upper part of the drum, and is provided with a door. Below the oven a chamber is formed and provided with an apertured bottom, the outer end of this chamber being closed by a sliding gate. If the heater or oven becomes overheated, the sliding door or gate is opened to let the surplus heat out. The heated air in the vertical pipe can be conducted into several rooms or apartments, as may be desired, suitable registers being provided for regulation. This invention has been patented by Mr. Joseph H. Lindsay, of Freeland, Pa.



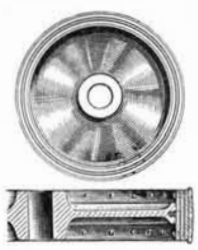
Combined Shutter Worker and Blind Slat Operator.

This is a combined shutter worker and blind slat operator which is capable of manipulation from the interior of a window. It consists in a pair of concentrically arranged sliding shafts with knobs and clutches for controlling them, and wheels on the outer ends of the shafts. There is a toothed sector on the shutter for connecting it with the toothed wheel on one of the shafts, and sliding toothed rack connected with the bar that controls the slats and engaged by the toothed wheel on the other shaft, so that according as one or the other of the knobs is pushed in or out and turned, the shutter or the slats will be closed or opened and locked in any desired position. This useful invention has been patented by Mr. David Beal, of Doylestown, O.



New Emery Wheel.

This emery wheel has a cast iron wheel with wrought iron tire shrunk upon it. To the wrought iron tire is secured by rivets a leather band to form a seat for the leather cover that carries the emery compound. The hub of the wheel is cast with a circular web. The rim is thickened to form a substantial seat for the tire. The tire in addition to being shrunk on is further secured in place upon the wheel by screws passing through the tire and into the rim. To the tire is secured by copper rivets or otherwise a leather band, to which is cemented a second leather band; to this the emery compound is applied in the ordinary manner. With this construction the wheel has no projecting parts to catch the air, and it will run smoothly, and at the same time the wrought iron tire binds the wheel firmly together, so that it will not be liable to burst. This invention has been patented by Mr. John McLaughlin, 453 Water Street, New York city.



Reflector for Lamps.

The engraving shows a novel and simple reflector for application to lamps of all sizes and forms. To the upper edge of the reflector are secured wire hooks bent downward to provide for hooking over the top edge of the chimney. Wire stays or braces are attached to the lower edge of the reflector, and diverging with their front ends rounded to cause them to receive partly within them the lower portion of the chimney, and to keep the reflector set out its proper distance at its bottom from the chimney. By slightly straightening out the hooks and bending the stays further apart the reflector will be made to occupy a lower position relatively to the flame, and it will then be converted into a simple shield for use in a sick room or elsewhere, or by straightening the stays the reflector may be adjusted into a position which will adapt it to act as an ordinary lamp shade. In both of these positions it will cast no shadow or have any darkening effect on the portion of the room designed to receive the light. This invention has been patented by Mr. Henry F. W. Seele, of Rolla, Mo.

Calf Weaner.

This invention relates to the class of calf weaners adapted to be attached to the central cartilage of the calf's nose, like a bull ring, the parts of the weaner being provided with sharp points that come against the cow's bag when the calf attempts to suck. The parts or sections of the device are attached together by a pivot forming a part of one of the points. They are held closed by means of a small screw. This device is very effective, simple, and cheap. Mr. William F. Geissler, of Comfort, Texas, is the patentee of this invention.

Hints on Sleep.

The question of chief importance to most people in these overwrought, wakeful days and nights is how to get good sleep enough. Dr. Corning drops a few simple hints which may be of value. In the first place, people should have a regular time for going to sleep, and it should be as soon as can well be after sunset. People who sleep at any time, according to convenience, get less benefit from their sleep than others; getting sleep becomes more difficult; there is a tendency to nervous excitability and derangement; the repair of the system does not equal the waste. The more finely organized people are, the greater the difficulty and the danger from this cause. The first thing in order to sleep well is to go to bed at a regular hour, and make it as early as possible. The next thing is to exclude all worry and exciting subjects of thought from the mind some time before retiring. The body and mind must be let down from the high-pressure strain before going to bed, so that nature can assert her rightful supremacy afterward. Another point is, never to thwart the drowsy impulse when it comes at the regular time by special efforts to keep awake, for this drowsiness is the advance guard of healthy, restorative sleep. Sleep is a boon which must not be tampered with and put off, for if compelled to wait, it is never so perfect and restful as if taken in its own natural time and way. The right side is the best to sleep on, except in special cases of disease, and the position should be nearly horizontal. Finally, the evening meal should be composed of food most easily digested and assimilated, so that the stomach will have little hard work to do. A heavy, rich dinner taken in the evening is one of the things that murder sleep. Late suppers with exciting foods and stimulating drinks make really restorative sleep next to impossible. Narcotics are to be avoided, save as used in cases of disease by competent physicians. The proper time, according to Dr. Corning, to treat sleeplessness is in the day-time, and it must be treated by a wise and temperate method of living rather than by medicines. This is good common sense, says the *New York Star*, from which paper we copy, and doubtless a vast deal of the debility, nervous derangement, and the insanity of our time would be prevented by more good, restful natural sleep.

Iron and Steel Magnetized by Breaking.

At a recent meeting of the Society of Physical and Natural Sciences, Karlshruhe, M. Bissinger made a communication on the magnetization of bars of steel and iron when broken on the machine serving to test them. The phenomenon is not due to elongation of the bar, but to the actual breakage; and both parts are converted into two magnets of sensibly equal power. The shock and trembling of the metal on breaking is probably the cause of magnetization. According to Professor Hughes' recent experiments, in the testing machine the bars are placed vertically, and the south pole is formed at their upper part. The different iron objects near the machine at the moment of rupture and vibration are also magnetized, but to a less degree.

MR. W. H. VANDERBILT recently received a letter from an inventor, asking him for a gift of $500,000, to enable him to perfect a perpetual motion machine. As incredible as it may appear, the request was not complied with. We fear Mr. Vanderbilt has very little sympathy with struggling genius; and if the inventor becomes discouraged and commits suicide, he will be another victim of monopoly.

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ENGINEERING INVENTIONS.

An improved car axle is the subject of a patent granted to Mr. Henry C. Atkinson, of Franklin, Ky., in which he provides a railway car axle having removable journals, so that when the journals become worn the axle may be repaired by placing new journals thereon.

Mr. Edward R. Brown, of Spartanburg, S. C., is the patentee of an improved car coupling. The upper part of the drawhead is provided with a hook projection, over which a U-shaped spring frame is passed for coupling the cars. This frame is held firmly in place by two hooks on the extremity of a lever which extends to the top of the car, between which levers the crossbar of the frame is passed. The cars are uncoupled by raising this lever and thus elevating the frame which secures the two cars together.

A very simple automatic car coupling has been patented by Mr. T. B. Nutting, of Morristown, N. J. The drawhead is provided internally with a drawbar which has a hook on its forward end that engages with the connecting link for coupling the cars, the said drawbar being raised automatically by the entering link. A rod from the drawbar passes to the top of the car for uncoupling the same. This invention is intended as an improvement upon a patent granted to Messrs. Nutting & Graveline in December, 1877.

Mr. Cephas Shelburne, of Johnson City, Tenn., has obtained a patent for an improved gas engine in which gaseous pressure within the cylinder, resulting from the combustion of a mixture of inflammable gas and air, causes the piston to perform its stroke, the products of the combustion being expelled by the return stroke of the piston. The objects of the invention are to obtain greater speed and power in proportion to the size of the cylinder, and greater uniformity in its running; further, to simplify the construction of the engine, thus rendering it more practicable than other gas engines which have been introduced.

An improved car coupling has been patented by Mr. William E. Drew, of Richmond, Va. The drawhead has a V-shaped mouth to receive a clevis-shaped coupling link and a horizontal coupling pin held forward by a spring. With the coupling pin is connected the arm of a spring-drawn sliding rod, and with this sliding arm is connected the arm of a second spring-drawn sliding rod having projecting ends, by which the coupling pin can be pushed back to uncouple from the sides of the cars. Within a recess in the two part drawhead is pivoted a spring pressed arm to engage with the end of the coupling pin and hold it in an uncoupled position.

Mr. Levi H. Roberts, of Paris, Ill., is the patentee of an improved car axle and box, the object of which is to prevent the sudden stop of the cars in their sidewise or swaying movement, and to lessen the friction, in rounding curves; and to so construct the frame of the axle box that the parts of the box will remain in place when the bolts are entirely withdrawn; and to these ends the invention consists in providing elastic or yielding surfaces for taking the side thrusts of the axle, and in making the bottom and ends of the frame from one piece of metal with solid, bent, or welded corners. This invention is an improvement upon a patent granted to Mr. Roberts in December, 1882.

Among the recent improvements in car couplings is the invention of which Mr. Wheeler W. Fitch, of Honeoye Falls, N. Y., is the patentee. The drawhead consists in two hollow castings secured together by suitable bolts, and having its throat cut away to receive the spear-headed connecting link, for coupling the cars. This connecting link is retained in the drawhead by means of jaws formed upon the shaft, which are journaled vertically in the casting. The shaft is provided with springs which hold the jaws face to face in the center of the casting, so that they will engage with the head and retain it securely. Devices are provided for turning the shaft and releasing the connecting link in uncoupling the cars. This car coupling is automatic in its action, very strong, and not likely to get out of order.

MECHANICAL INVENTIONS.

An ingenious improvement in door locks has been patented by Mr. William Rowe, of Haverhill, Mass., the important feature consisting in the construction of the lock so that it can only be unlocked from the side of the door upon which it was locked, rendering it specially applicable for prisons and like institutions.

A novel machine for improving and mending roads has been patented by Mr. Lewis Lamborn, of Hamorton, Pa. This machine is mounted upon wheels and is so constructed that the surface of the road will first be scratched by a series of teeth arranged in the forward part of the frame, after which the loose earth will be disposed by a scraper set at an angle, so as to give the desired shape to the road.

Mr. Auguste Lambert, of Fosse, Belgium, has obtained a patent for some important improvements in sewing machines. The invention just patented is an improvement upon a patent granted to the same inventor in August, 1882, and relates, among other things, to mechanism for driving the shuttle driver and for rotating the hooked ring, both being accomplished in a very satisfactory manner.

Mr. John Dempster, of Knoxville, Tenn., has recently obtained a patent on an improved millstone driver which is designed specially for that class of mills in which the spindle is made to stand vertically and support the runner stone. The object of the new invention is to provide better means for balancing the runner stone and rigidly securing it to the spindle, so that the flour may be granulated in a superior manner.

An automatic safety cock for gas burners has been patented by Mr. Andrew Archibald, of Yonkers, N. Y. The object of this invention is to provide a safety cock for gas burners which will automatically close when the light is extinguished, whether this be done by turning the cock or by blowing the light out, and which will be reliable and certain in its action, and will not interfere with the flow of gas while burning.

A cotton gin rib of improved device has been patented by Mr. W. S. Anderson, of Duncansby, Miss. This invention consists of the combination of re-enforcing wearing plates applied to the sides of the ribs, these plates being made tapering toward their lower ends, and flared inwardly with said ribs, which are recessed correspondingly to permit the holding of the plates in position without screws, and to permit their removal with facility.

Mr. George W. Foskett, of Winchendon, Mass., has patented a machine for turning round tenons for chair legs and similar articles, and the invention consists in the combination of rotary clutches for carrying the work to the cutters, revolving chucks carrying the tenoning cutters, and saws for cutting the legs or other articles to uniform length, together with mechanism for regulating the length of the tenon and for effecting the successive operations automatically.

Mr. Daniel Hansz, of Sullivan, Ind., has obtained a patent for an improved motor, which consists of a triple crank driving shaft with foot treadle, hand lever, and seat lever attachments, whereby the power of the hands and feet and the weight of the body may be exerted on the driving shaft. The inventor claims that this power, while it may be employed for other purposes, is especially adapted for propelling wagons, hand cars, tricycles, boats, elevators, etc.

An improved boot or shoe sole stamp is the subject of a patent granted to Mr. William C. Hoar, of Spencer, Mass. This invention consists of a device for stamping the holes in the soles of boots and shoes in which the nails or pegs are to be driven for making figures in special design, and it is equally applicable for making the holes around the edges for the pegs, by which the soles are to be nailed to the upper of the shoe.

A novel invention for facilitating the manufacture of lead pencils has been patented by Mr. Paul E. Gonon, of New York city. This invention relates to the manufacture of that class of pencils which have a central marking core, incased by a wood fiber or analogous material pressed around the core in a plastic or semifluid state. The great advantage of this process is that a superior article is produced at a considerably reduced price.

A very convenient and practicable camera stand, which presents many improvements over those at present in use, has been patented by Mr. W. R. Wright, of Princeton, Ind. This stand is supported by a tripod and has a central shaft, to the lower end of which is attached by a cord a balancing weight, by means of which the camera is raised and held at any desired height. The table, upon which the camera rests is so constructed that the instrument may be revolved or adjusted right and left, and may be set in any angle to the horizon.

An ingenious adding machine has been patented by Mr. Albert Stettner, Jr., of Berlin, Germany. The invention consists in an adding machine constructed with a spirally grooved cylinder carrying the numbers from 1 to 1,000, which cylinder is revolved more or less according as the series of key rods are depressed. The operator depresses the key which corresponds with the number he wishes to add, and after he has manipulated all the numbers he ascertains the result by looking through an opening left for that purpose at the top of the machine.

Mr. Andrew H. Ballagh, of Macon, Mo., is the patentee of an improved baling press. The material to be compressed is placed within the baling chamber through an opening in the top. The follower is then brought to bear against the material by means of a sweep, which is connected by links with the toggle bars of the follower. When the material has been compressed into a bale, separating boards are inserted and the operation continued as before, the baling chamber thus containing several pressed bales at the same time, the bands and ties being applied to the completed bale while the next bale is being compressed.

A new and improved station indicator has been patented by Mr. Henry Koehler, of Pomeroy, O. This improvement consists in a band having the names of the various stations indicated upon it. The band is arranged to wind over two rollers, one of which is provided with a crank by which the attendant rotates the band, and exposes to view the name of the station at which the train is stopping. A gong is sounded at the same time to call the attention of the passengers to the indicator. Separate edge strips may be provided on the same rollers for showing the distance the train has run from a given place, the time it was due, etc.

Mr. William H. Ernst, of Chase, Kan., has obtained a patent for an improved grain weighing apparatus which automatically weighs and registers the weight of grain. This apparatus consists of a couple of hoppers with falling bottoms and a shifting gate or valve, connected with one another in such a manner that the bottom of one hopper, falling to discharge its load, is made to raise and close the bottom of the other hopper, the valve by which the grain is conducted into the respective hoppers being shifted at the same time, while the registering apparatus is operated by the falling of the bottoms.

A very simple and practicable amalgamator for separating the free gold from auriferous earth, without the use of water, but which may be used with water if desired, has been patented by Mr. Henry Cook, of Leadville, Colo. This apparatus consists, essentially, of means for rolling and otherwise causing the earth or powdered ores to flow over amalgamating copper plates charged with quicksilver, in imitation of the action of water in the sluice machines, and causing the particles of gold to come in contact with the charged plates, together with an arrangement of quicksilver baths for separating particles too large to be taken up by the plates.

Mr. Charles Conner, of New York city, is the patentee of an improved wire wrapping or covering machine. The object of the invention is to provide a machine by which wire may be wound with one or more strips of rubber or similar material for insulating wire. The strip or ribbon first applied to the wire is fed off from a reel attached to the eye plate, and thence passes through suitable guides, which turn or roll up the edges of the strip before it reaches the wire and eye, and the wire itself is drawn from a primary reel through the eye and sleeve by means of rubber rollers placed immediately in the rear of the sleeve, from which rollers it passes, completely covered, to the final winding drum or reel at the end of the machine.

An improved apparatus for soaping and dyeing textile fabrics, in which the material to be operated upon is passed over rollers, and is thus immersed in the soaping or dyeing liquid, has been patented by Messrs. John Gibson, Jr., of Mottram, County of Chester, and John Platt, of Manchester, County of Lancaster, England. The object of this invention, when applied to soaping, is to get rid of the thickening which has been used as a vehicle to carry the color or mordant when printing, thereby leaving the color only in the fabric. When applied to dyeing, the object is to cause the coloring matter in the liquid to thoroughly impregnate the fabric. This improved apparatus is claimed to effect this operation with greater facility than any hitherto employed.

AGRICULTURAL INVENTIONS.

A combined harrow, seed planter, and cultivator, which recommends itself to farmers as saving them the expense of buying a separate machine for each operation in raising crops planted in rows, has been patented by Mr. Robert F. Ellis, of Whitt, Tex.

Mr. Francis A. Pettitt, of Valley Mills, Tex., has patented an improved cotton chopper and cultivator, which commends itself to the public for its simplicity. The machine can for the most part be made by hands of ordinary skill, such as are generally available whenever such machines are required for use. Mr. Pettitt is to be congratulated for producing a machine to supply such a long felt want.

A new hand corn planter, designed to expedite the operation of planting corn in the hill, has been patented by Mr. Samuel M. Macomber, of Grand Isle, Vt. This planter is provided with a seed box and with a sliding seed cut-off, by means of which the seed is admitted in the quantity required into a receiver below, from whence it is dropped into the ground. A plate projects a few inches above the lowest part of the planter for regulating the depth of thrust of the machine, so that all the kernels of seed may be deposited at equal depth in the soil. This hand seed dropper is an improvement on a similar machine patented in 1882.

A very simple device to be applied to a harvesting wagon for stacking straw has been patented by Mr. Christopher Leffingwell, of Clarksburg, O. The wagon is provided with a stacker made in two parts hinged together at their adjacent ends, so that when the stacker is to be brought into use it may be readily extended and placed in position, and there supported by chains and guy ropes. The stacker may be so made to extend to any desired length, and when not in use it is folded into small compass for transferring from one field to another, and for convenient housing after the harvesting season is over.

MISCELLANEOUS INVENTIONS.

A composition to be used for kindling fires has been patented by Mr. William J. Babb, of Troy, N. Y. The mixture consists of charcoal, corn cobs, petroleum, tar, and some heavy hydrocarbon, such as linseed, cotton seed, or fish oil, mixed together in certain proportions.

Mr. Wilhelm Reissig, of Darmstadt, Germany, has patented an improved stamping ink which is made by adding to ordinary printer's ink iron oxide and oxidulated iron, metallic iron in the finest possible solution or powder, all of which is intermingled with linseed oil, varnish, and lamp black.

Mr. Magnus Gross, of New York city, has patented a retort for making illuminating or fuel gas from crude oil, naphtha, or other liquid hydrocarbons and superheated steam, by the aid of which dissociation and readjustment of the constituents of any liquid hydrocarbens and steam can be accomplished simultaneously and in the nascent state.

A horse blanket has been patented by Mr. Edgar W. Allen, of Rock Island, Ill. The novelty and use consist of stays, instead of being attached in the ordinary way, extending along the side of the horse, and connect with one another at the neck and tail, so that the strain will be brought to bear upon the stays instead of upon the blanket.

A harness pad has been patented by Mr. Edward Kettering, of Jefferson City, Mo., which can be very quickly and cheaply made. The new pad is very neat in appearance, and is so constructed that the trimmings and skirt straps may be removed and new ones supplied without taking the pad apart, thus lessening the liability of injuring it.

An improved mode of attaching lumber wagon bodies to the bolster of the running gear has been patented by Mr. Palmer Stafford, of Green River, Ill. By a peculiarly constructed strap the inventor confines the body of his wagon to the bolster so firmly that the jar and rattle usual in this class of farm wagons is obviated.

A workman's dinner pail for carrying food and liquids in a compact and tidy manner is the subject of a patent recently granted to Messrs. F. McC. Starbuck and R. M. Taylor, of Ansted, W. Va. The pail is provided with a movable dish and with two semicircular covers hinged on opposite sides of the pail. The covers are provided at their inner edges with projections for holding a cup when the covers are closed.

A simple and convenient bag fastener has been patented by Mr. C W. Bradford, of Belfast, Me. A chain having a crossbar is attached to one end and a slitted curved plate at the other end, which chain is provided with a hook for holding it to the bag. The chain is passed around the gathered part of the bag and drawn up tight, and a link is passed into a slit of the plate fastening the bag.

An improved starch for stiffening and giving a superior gloss to washed articles without injuring their texture, has been patented by Mr. Julius Gunther, of Quincy, Ill. This starch consists in the combination in certain proportions of common starch, crystallized sulphate of ammonia, and crystallized boracic acid, the whole forming a compound which not only presents the advantages above cited, but renders the objects on which it is used fireproof.

An underwaist for children is the subject of a patent granted to Mary E. Higgins, of Cadillac, Mich. This invention consists in a laced waist composed of two seamless half bodies and capable of adjustment down its back and front to vary its size, combined with the waist straps for supporting the hose and leggins of the wearer, all the parts being so adjusted that a child wearing the article has the greatest liberty of action, and without any strain on the body.

Mr. Joseph T. Dunham, of Brooklyn N. Y., has patented a combined tag and envelope, which is so constructed that the bill or invoices can be sent with the goods, which is a matter of great importance, especially if the goods are perishable, so that the merchant may know the cost to permit immediate sale. Furthermore, in this envelope the address is concealed, and dealers cannot ascertain the addresses of the customers of their competitors. The invention is particularly designed for express companies' use.

A very convenient shot holder for the use of retail dealers has been patented by Mr. James C. Turner, of Sterling, Kan. This improvement consists in a holder having a number of revolving receptacles, each compartment being designed to hold a different size of shot. These chambers are provided at the bottom with an opening through which the shot is discharged as desired. Each chamber is likewise provided with a glass side opening, by means of which the grade of shot contained therein may be ascertained.

An improved spring bed has been patented by Mr. George Wenzell, of Detroit, Mich. This improvement consists essentially of two frames connected by levers and springs, so that either frame may serve for the base, and will support the other, which has the bed on it, the spring or springs, together with the levers, preserving the level of the surface, while affording the required elasticity of the bed, whereby the bed will be depressed alike over all its surface if the weight is centered upon one part only.

Mr. Jacob O. Hopping, of Sagg, N. Y., is the patentee of an improved thill coupling, which is designed to prevent rattling of the thills. The invention consists in a latch pivoted on one of the jaws of the axle clip, which latch prevents the bolt from passing out of the jaws and the thill eye. The latch is provided with a plate fitting over the head on the end of the bolt, and the inner end of the latch is provided with a curved shank fitting on the axle. This device is very simple and effective

A very simple and inexpensive box opener has recently been invented, which greatly facilitates the operation of removing covers from boxes. This tool consists of two cross pivoted handles provided at their ends with two inwardly extending jaws wedge-shaped at the edges, and adapted for insertion under the cover of the box. By pulling the two handles away from one another, the two jaws will be brought together and the cover of the box pried up. The patentee is Mr. T. L. Stanwood, of Brunswick, Me.

Messrs. James G. Leslie, of Oregon, and W. A. Hall, of Pine Rock, Ill., have obtained a patent for an improved wagon box and hay rack. The box of the wagon is so constructed that when desired top sections are attached to the sides by means of outside and inside cleats, by which device the capacity of the box is greatly increased. The rack attachment consists of inclined arms which rest upon the upper edges of the sides, being stayed at the end and middle by jointed crossbars. The arrangement is simple and may be readily adjusted by a single person.

An improvement in pantaloon suspenders has been patented by Mr. Abraham Schenfield, assignee of Mr. Bernard Petchaft, of New York city. The suspender straps are of the usual form, and the improvements relate to the buckles and the end straps, the former being double buckles, in the upper portion of which the main suspender slides, and is held at any desired length. The lower portion of the buckle is provided with a tongue which engages with the end straps, which are secured together by eyelets which hold them securely in place.

An improved coffee pot has been patented by Mr. Lewis W. Walker, of Minneapolis, Minn. The invention relates to the class of coffee pots in which an inner vessel for the coffee is arranged within an outer vessel, with a water space between the vessels. The object of Mr. Walker's invention is to condense the steam formed in the water jacket between the vessels in the process of making the coffee, and allow it to flow back into the water jacket, whereby the quantity of water necessary to be used in the water reservoir is reduced, and its escape in the form of steam is prevented.

A grain drying and cooling shelf for manipulating the grain in drying kilns where artificial heat is employed for rapid expelling of the moisture has been patented by Mr. Henry Cutler, of North Wilbraham, Mass. This invention consists of a series of inclined shelves, so constructed that the grain may be spread out to be cooled over large areas of surface and returned again to the delivery spout by the action of gravity. The grain is moved slowly over the shelves, its direction being frequently changed and its motion being retarded by the shelves and by counter currents of air, so that the velocity of movement will be limited and the grain thoroughly cooled and dried.

Mr. August Hoen, of Baltimore, Md., has obtained a patent as a new article of manufacture on a hat lining, which consists in providing by any printing process an imitation of the more expensive kind of hat lining, where the central colored strip is made of heavy material for stamping the manufacturer's name upon it, and the side strips of lace or other gauzy material. Mr. Hoen has also obtained a patent for preparing a lithographic stone or plate for lithocaustic engraving, consisting in stopping out or filling in with ink at regular intervals of space the lines drawn on an etching ground, thereby producing a series of dotted lines in place of those which were previously continuous. Clouds and other varied effects may be also successfully obtained by Mr. Hoen's newly patented process.

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Business and Personal.

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Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 35 Murray St., N. Y.

Wanted to sell on commission on the road, engine and boiler supplies. Box 127, Painesville, O.

For Sale.—Clock maker's wheel cutting engine, dial, 24 inches; fly and mill cutters. J. L. Finn, Elyria, O.

Fifty for fifty cents, one hundred for one dollar. Bona fide addresses of thriving South Carolina farmers. Men who make money. Archer & Rains, Strother, S. C.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Peck's Patent Drop Press. See adv., page 365.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

Eagle Anvils, 10 cents per pound. Fully warranted.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 364.

Gould & Eberhardt's Machinists' Tools. See adv., p. 365.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 366.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 364.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 366.

Upright Self-feeding Hand Drilling Machine. Excellent construction. Pratt & Whitney Co., Hartford, Conn.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

Contracts taken to manuf. small goods in sheet or cast brass, steel, or iron. Estimates given on receipt of model. H. C. Goodrich, 66 to 72 Ogden Place, Chicago.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 65 Arc Lights with 35 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

Curtis Pressure Regulator and Steam Trap. See p. 349.

LightningScrew Plates, Labor-saving Tools, p. 248.

Engines, 10 to 50 horse power, complete, with governor, $250 to $550. Satisfaction guaranteed. More than eight hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

Metal Patterns,
Punches and Dies to order.
Geo. Van Sands, Middletown, Conn.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 333.

The Sweetland Chuck. See illus. adv., p. 334.

Knives for Woodworking Machinery, Bookbinders, and Paper Mills. Taylor, Stiles & Co., Riegelsville, N. J.

Best Squaring Shears, Tinners', and Canners' Tools at Niagara Stamping and Tool Company, Buffalo, N. Y.

Lewis' Combination Force Pump makes three machines made of brass throughout. See Adv. page 317.

Saw Mills, Hauck & Comstock, Mechanicsburg, Pa.

Stenographers, type-writers, clerks, and copyists may be obtained free of charge at the Young Women's Christian Association, 7 East 15th Street, New York.

Lathes 14 in. swing, with and without back gears and screw. J. Birkenhead, Mansfield, Mass.

Five foot planers, with modern improvements. Geo. S. Lincoln & Co., Phœnix Iron Works, Hartford, Conn.

The Best.—The Dueber Watch Case.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

Farley's Directories of the Metal Workers, Hardware Trade, and Mines of the United States. Price $3.00 each. Farley, Paul & Baker, 530 Market Street, Phila.

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Permanent Exposition.—Inventors' Institute, Cooper Union, N. Y. City. Every facility for exhibition of machinery, merchandise, and inventions. The expense is small—the advantages great. Send for particulars.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Lists 29, 30 & 31, describing 4,000 new and 2d-hand Machines, ready for distribution. State just what machines wanted. Forsaith & Co., Manchester, N. H., & N. Y. city.

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Send for Monthly Machinery List
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"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 84 John St., New York.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, New Haven. Conn.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

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Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) W. A. P.—Lacquer for brass: Dissolve good clear shellac half an ounce in one pint 95 per cent alcohol, in a bottle, corked; put in a warm place and shake occasionally for a day or so. Then let it settle; pour off the clear transparent part for use. If too thick, thin with 95 per cent alcohol. If more color is required, add a little dragon's blood for red and turmeric for yellow.

(2) A. W. W. asks: Where can I find data relating to the number of units of heat that will be radiated from steam pipes? A. The following formula is given by Haswell, and may answer your purpose:

$$\frac{1{\cdot}7\, l\, (T-t)}{d\, v} = R = \text{Radiation in degrees per second.}$$

l=length of pipe in feet; T=temperature of surface of pipes; t=temperature of the air; d=diameter of pipe in inches; v=velocity of the heat in feet per second.

(3) H. C. asks if it is possible for water to be forced through rubber which is warranted to be waterproof, supposing that the rubber is supported by a hard substance so as to prevent its stretching; or suppose it to be stretched, how thin a piece would prevent the water from penetrating it? If it will penetrate a thin piece and not a thick one, how thick should it be in order to prevent water from coming through it? A. It is probable that rubber that is warranted waterproof is waterproof under ordinary circumstances. Water under pressure will pass through many substances that are considered waterproof when no pressure is applied. You may possibly obtain pure gum that will stand considerable pressure if it is properly stayed or backed.

(4) S. S. M. asks how to make a paint for blackboards. A. To make one gallon of the paint take 10 ounces of pulverized and sifted pumice stone, 6 ounces powdered rotten stone (or infusorial silica), three-quarters pound of good lampblack, and alcohol enough to form with these a thick paste, which must be well rubbed and ground together. Then dissolve 14 ounces of shellac in the remainder of the gallon of alcohol, by digestion and agitation, and finally mix this varnish and the paste together. It is applied to the board with a brush, care being taken to keep the paint well stirred so that the pumice stone will not settle. Two coats are usually necessary. The first should be allowed to dry thoroughly before the second is put on. The second coat should be applied so as not to disturb or rub off any portion of the first. One gallon of this paint will ordinarily furnish two coats for sixty square yards of blackboard. When the paint is to be put on plastered walls, the walls should be previously coated with glue size—glue, 1 pound; water, 1 gallon; lampblack, q. s. to color; put on hot.

(5) B. G. writes: I want to know how to tan skins so as to leave the fur on. Can you give this information? A. Wash the skins in water, and cleanse them thoroughly by scraping or rubbing. Then rub well into the flesh side of the skin the following mixture: Alum, powdered, 2½ pounds; salt and coarse wheat meal, each one pound; sour milk, q. s. to form a thin paste. When the skin will absorb no more of this preparation, spread a layer of the latter over it (on the flesh side), and fold up the skin with the flesh surfaces together and put it away in a cool place for a day. Repeat this pasting and rubbing each day for a week, washing out and half drying the skin every third day. Finally, thoroughly wash the skin in running water, drain, brush over it (flesh side) a strong solution of alum in water, and hang it up to dry. The dry skin is softened by rolling and pounding it with mallet or rubbing and stretching it with a flexible tool. It is commonly finished by rubbing down the flesh side with pumice stone.

(6) E. A. Y. asks: Can any injurious effects result from having plants in living or sleeping rooms? A. It has been fully proved by chemical examination and otherwise that plants in living rooms or in bed rooms rather purify the air than otherwise. Yet they may in some cases prove injurious in sick rooms, when the odor is offensive to invalids. Whatever annoys the sick does harm to a greater degree than healthy persons can understand.

(7) L. B. D. asks how to remove black worms from the face. A. The black points, fleshworms, or comedones, which are found in the face, and especially near the nostrils, are not at all produced by the accumulation of the particles of dirt or dust, as has generally been believed, but by pigmentary matter which is soluble in acids. The following treatment has been recommended: Kaolin, 4 parts; glycerine, 3 parts; acetic acid, 2 parts, with or without the addition of a small quantity of some ethereal oil. With this pomade cover the parts affected in the evening, and if need be during the day. After several days all the comedones can be easily expressed; most of them even come out by washing the parts with pumice stone soap. The same results can be obtained by bandaging the parts affected for a long time with vinegar, lemon juice, or diluted hydrochloric acid. The acids act like cosmetics, as they transform the black color into a brown and yellow shade and destroy it gradually altogether.

(8) J. asks how to produce artificial marble. A. Reduce marble dust or white limestone to a very fine powder by grinding and sifting, mix with it intimately about one-fourth its weight of zinc oxide (zinc white) and one-eighth its weight of Portland cement, and mix thoroughly into a thick paste with a sufficient quantity of a hot aqueous solution of waterglass, containing about 40 per cent of the glass. Mould the paste under pressure while warm, and expose the moulded form for a week or ten days to warm dry air, before finishing.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

May 29, 1883,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising fan, C. De Quillfeldt 278,410
Air engine, H. H. Burritt 278,397
Alarm. See Fire alarm. Fire and burglar alarm.
Ale condenser, J. W. Evenden 278,525
Auger, Halligan & Rugg 278,539
Axle, vehicle, M. E. Burris 278,396
Baby carrier, J. H. Lancaster 278,437
Bagasse furnace, I. A. Hedges 278,547
Baling press, J. A. Spencer 278,371
Barrel cover, F. G. Lane 278,563
Barrel cover, expansible, A. Swoboda 278,670
Bed bottom, M. E. Graves 278,330
Bed bottom, spring, A. F. Purefoy 278,362
Bed, folding, L. Leeds 278,564
Bedstead fastening, B. A. Wilton 278,649
Belt fastener, Budlong & Talcott 278,393
Bessemer process, basic, J. Reese 278,363
Bevel, carpenter's, Cumming & Van Amringe 278,405
Bicycle saddle, T. J. Kirkpatrick 278,560
Board. See Bulletin board. Electric switch board.
Boat. See Life boat.
Boiler furnace, steam, E. W. Vanduzen 278,637
Boot or shoe, Belknap & Fye 278,308
Boot or shoe clamp, O. T. X. Adams 278,385
Bottle carrying box, J. C. Cary 278,504
Bottling liquids, device for, W. T. Ferre 278,661
Bouquet holder, J. Darrach 278,514
Box. See Bottle carrying box. Match box. Paper box. Wagon box.
Box covering machine, Manneck & Witte 278,442
Bracket. See Lamp bracket.
Braiding machine, E. & E. Rafer 278,669
Brake. See Locomotive brake. Locomotive or car brake. Wagon brake.
Branding device, J. S. Smithson 278,621
Bridle bit attachment, D. C. McCoy 278,576
Brushes, manufacture of, A. C. Estabrook 278,660
Buckle and trace carrier, W. S. Brown 278,501
Building, fire proof, W. L. Black 278,491
Bulletin board, C. H. Tessy 278,630
Burner. See Gas burner. Oil burner.
Bushing for tube sheets, J. Strachan 278,625
Button, J. Costello 278,314
Button, R. H. Isbell 278,556
Button fastener, G. W. Prentice 278,360
Button holes, making, J. Ware 278,473
Button or stud, I. S. Burke 278,395
Cake, jumble, and snap machine, M. De Tambel 278,318
Can. See Ice machine can.
Can opener, O. R. Webster 278,379
Car brake, C. W. Smith 278,616
Car buffer, A. Gallinant 278,328
Car buffer, J. T. Schaffer 278,606
Car coupling, N. P. Cowell 278,403
Car coupling, H. E. Hawk 278,334
Car coupling, C. E. Mark 278,573
Car coupling, J. Rhule 278,598
Car coupling, C. H. Schaaff 278,605
Car coupling link, F. Sweetland 278,626
Car door and fastening, W. P. Senour 278,611
Car door catch, grain, D. F. Van Liew 278,377
Car, dumping, S. D. King 278,343
Car starter, C. P. Warnick 278,378
Carbon plates, apparatus for making, Molera & Cebrian 278,355
Card grinding machine, C. Schrebler 278,608
Card, playing, A. Dougherty 278,412
Carriage, jump seat, O. Morrill 278,583
Carrier. See Baby carrier. Cash and parcel carrier. Straw carrier.
Cartridge primer, J. H. Bullard 278,394
Carving fork, C. L. Butler 278,598
Cash and parcel carrier, G. R. Elliott 278,658, 278,659
Cash carriers, drop cradle and elevator for, J. C. Coram 278,510
Casting steel ingots having iron centers, method of and mold for, J. Pedder 278,593
Casting stereotype plates, C. Baechler 278,652
Celluloid, etc., apparatus for producing rods or tubes of, A. Olszewski 278,667
Celluloid, etc., mold for forming articles of, A. B. Diss 278,321
Chain, dredger, H. B. Angell 278,482
Chain, ornamental, J. B. Peck 278,454
Chandelier, extension, D. W. Parker 278,359
Check rower, smooth rope and knotted wire, D. Spooner 278,622
Churn, M. A. Briggs 278,391
Clamp. See Boot or shoe clamp.
Clasp. See Corset clasp.
Clevis, plow, A. Patton 278,453
Clock springs, maintaining power for, F. T. Marchand 278,572
Clothes pounder, Elliott & Lloyd 278,522
Clutch and brake, combined, C. H. Rohde 278,601
Coach, H. F. Stahmer 278,463
Condenser, injector, J. Wheelock 278,476
Cooling or drying granular materials, apparatus for, Niese & Dinkel 278,356
Coping for walls, E. C. Clark 278,656
Cord, tape, etc., device for holding, C. F. Sleeper 278,615
Core or center, contractible, Hoopes & Paist 278,551
Corks from bottles, drawing, J. E. Berlien 278,388
Corset clasp, M. W. Henius 278,430
Cotton gin feeder, W. O. Coleman 278,402
Cotton separator and cleaner, seed, W. O. Coleman 278,401
Coupling. See Car coupling. Harness coupling. Thill coupling.
Covering, non-conducting, G. Kelly 278,559
Cultivator, E. R. Ham 278,541
Cultivator, G. W. Hammond 278,548
Cultivator, J. T. McIntire 278,577
Cultivator, H. H. Sater 278,366
Cultivator, D. Unthank 278,672
Cultivator and planter attachment, J. Palmer 278,452
Dental engine, E. T. Starr 278,464
Dental lip and tongue holder, J. H. Doyle 278,520
Disintegrating fibrous plants, machine for, D. Prieto 278,668
Disintegration of bagasse and other vegetable matter, apparatus for the, T. Harang 278,545
Doll, S. Eldridge 278,420
Domino, R. H. Williams 278,646
Electric currents from high to low tension, apparatus for translating, T. A. Edison 278,418
Electric light conductors, support for, L. Stieringer 278,465
Electric machine, dynamo, A. F. Delafield 278,516
Electric machine, dynamo, T. A. Edison 278,419
Electric machine, dynamo, E. Weston 278,641
Electric machine regulator, dynamo, T. A. Edison, 278,413, 278,414
Electric machine regulator, dynamo, E. Weston 278,640
Electric switch board, W. J. McElroy 278,353
Electrical conductors, protector attachment for, W. E. Townsend, Jr 278,635
Electrical connecter, H. E. Long 278,346
Electrical distribution, system of, E. T. Greenfield 278,535
Electrodes for secondary batteries, making, W. Wallace 278,638
Elevator. See Water elevator.
Elevator safety dog, G. Pilson 278,595
Emery wheel, J. McLaughlin 278,578
Engine. See Dental engine. Gas engine. Hot air engine.
Excavator, Simar & Dale 278,368
Excavator and loader, D. I. Calhoun 278,399
Extractor. See Stump extractor.
Fabrics, uniting, S. Arnold 278,484
Faucet, self-closing, Prier, Doherty & Everett 278,597
Feed water heaters, overflow for, G. A. Otis 278,590
Fence, barbed wire, G. C. Bigelow 278,389
Fence wire, machine for manufacturing barbed, D. C. Stover 278,624
Fencing, machine for manufacturing barbed, Ellwood & Upham 278,523
Fertilizer, J. R. Young, Jr 278,383, 278,384, 278,480
Fertilizer distributer, J. R. Anthony 278,483
Fire alarm, G. W. Nason 278,586
Fire and burglar alarm, B. J. Antrim 278,386
Fire alarm, magazine, W. H. Elliot 278,324
Fire arms, extractor for, G. H. Fox 278,424
Fire arms, fore end for breech loading, G. H. Fox. 278,423
Fire escape, A. L. Aldrich 278,651
Fire escape, C. F. Bierbach 278,310
Fire escape, W. Chase 278,655
Fire extinguisher, automatic, C. E. Buell 278,654
Fire extinguishing apparatus, D. Beck 278,307
Fire extinguishing compound, G. J. Crikelair 278,315
Fire kindling composition, W. M. Koon 278,496
Flour from grain, manufacture of, L. Gathmann. 278,531
Flue plugging device, F. Sharp 278,612
Fluting iron, R. Young 278,650
Fork. See Carving fork.
Form or stand, dress, G. M. Rockwell (r) 10,384
Fruit jar, L. Gallaher 278,530
Furnace. See Bagasse furnace. Boiler furnace.
Furnace for ingots, soaking, T. Critchlow 278,512
Gag runner, G. M. Hubbard 278,554
Gage. See Water gage.
Garment supporter, W. L. Braddock 278,493
Gas burner, A. B. Lipsey 278,568
Gas engine, J. A. Ewins 278,421
Gas engine, J. Robson 278,600
Gas or vapor, apparatus for producing illuminating, E. J. Frost 278,529
Glass articles, manufacturing, W. M. Wallace 278,472
Governor for railway heads, hygrometric, G. A. Ayers 278,488
Governor, steam engine ball, W. E. Badger 278,387
Grain binder, J. W. Webster 278,639
Grain binding machine, G. Esterly 278,524
Grinding minerals, etc., machine for, T. O. Cutler 278,407
Gun barrel, auxiliary, L. S. Harrison 278,546
Hammock, C. E. Hiester 278,431
Handle. See Pestle handle.
Hanger. See Shaft hanger.
Harness coupling, adjustable, L. Wartenberg 278,474
Harrow, J. A. Thronson 278,632
Harvester binding attachment, E. Ebi 278,521
Harvester platform adjustment, D. R. Preston 278,596
Harvesters, grain adjusting device for, M. E. Blood 278,492
Hat curling machine, G. Roth 278,458
Hat sizing apparatus, N. Harper 278,333
Hat sizing machine, A. T. Clark 278,509
Hat sizing machine, N. Harper 278,332
Hat starting and sizing machine, W. Simmonds 278,614
Hats in the process of manufacture, machine for washing, E. B. Taylor 278,467
Hauling upon slipways, apparatus for, J. Thompson 278,631
Hay knife, J. C. Moss 278,584
Hay rake, horse, M. Hallenbeck 278,538
Head rest, portable, E. F. Prescott 278,361
Heat of furnaces, utilizing the waste, W. H. Brooks 278,496
Heater, L. Stockdale 278,466
Heater and oven, combined, J. H. Lindsay 278,567
Heating apparatus, steam and hot water, F. Tudor 278,536
Hoist, barrel, W. Mack 278,570
Hoist or elevator, T. McDonough 278,445
Hoistway covers, closing and controlling, D. Fraser 278,528
Holder. See Bouquet holder. Pillow sham holder. Sash holder. Spooling machine bobbin holder.
Hook. See Snap Hook.
Hose, C. Callahan 278,312
Hot air engine, T. McDonough 278,446
Hub attaching device, J. Curtin 278,513
Hydrant, W. Kaiser 278,455

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Ice creeper, N. C. Jones 278,337
Ice machine can, H. F. Fordham 278,527
Indicator. See Station indicator.
Ingot manipulator, T. Critchlow 278,511
Insulating material, electrical, J. Greives 278,536
Insulator brackets, machine for making telegraph, J. B. Smith 278,618
Insulator pins, machine for making telegraph, J. B. Smith 278,619
Iron. See Fluting iron.
Jack. See Lifting jack. Wagon jack.
Jar. See Fruit jar.
Journal box lubricator, N. M. Bergqvest 278,309
Key. See Watch key.
Knife. See Hay knife.
Knit goods, manufacture of, S. Arnold 278,486
Lamp, F. A. Taber 278,373
Lamp bracket or fixture, incandescent, E. Weston 278,642
Lamps, manufacture of incandescing electric, T. A. Edison ..... 278,415 to 278,417
Lantern, C. T. Ham 278,540
Last, C. W. Glidden 278,426
Leg, artificial, W. D. Lewis 278,566
Life boat, T. Hamilton 278,542
Life preserver, J. N. Hoeffich 278,432
Lifter. See Sash lifter.
Lifting jack, J. Dawson 278,317
Lock. See Nut lock.
Locomotive, E. A. Trapp 278,470
Locomotive brake, W. B. Turner 278,471
Locomotive or car brake, Guernsey & Turner 278,429
Manual power, J. Bates 278,306
Match box, H. E. Hutchinson 278,555
Mechanical movement, J. T. Wickersham 278,644
Mechanical power, B. R. Trull 278,376
Metal surfaces, ornamenting, E. Horton 278,552
Millstone dressing machine, C. S. Hoover 278,335
Mirrors, transoms, etc., friction supporting device for, M. Safford 278,364
Motor. See Spring motor.
Mowing machine, C. W. Cheney 278,508
Necktie fastener, R. E. Kelsey 278,342
Needle, sewing, Rusling & Odell 278,459
Oil burner, C. Tondeur 278,374
Ore concentrator, dry, W. B. Farwell 278,325
Organ swell, reed, C. H. Davis 278,515
Overalls, C. O. Cole 278,313
Packing ring for pumps, W. E. Karns 278,557
Paddle wheel, E. L. Williams 278,477
Paint for roofing and other purposes, F. Jones 278,664
Paper box, J. Felbel 278,526
Paper, coating or waterproofing, C. A. Maxfield 278,443
Paper felting, manufacture of, F. J. Mather 278,350
Parer, apple, L. H. Scott 278,460
Pestle handle, G. Maris 278,575
Pile driver, J. Roy 278,603
Pillow sham holder, J. H. Miller 278,581
Pills with gelatine, machine for coating, G. W. Platt 278,456
Pipe. See Stove pipe.
Pipe, molding apparatus for the manufacture of, Ireton & Whitelock 278,663
Planer, metal, J. S. Detrick 278,518
Planing machine, R. B. Jones 278,338
Planter, bean, A. A. Stearns 278,372
Planter check rower, corn, G. W. Brown 278,500
Planter check rower, corn, Brown & Tunnicliff 278,653
Planter check rower, corn, Litterer & McKinniss 278,441
Planter, corn, G. W. Brown ..... 278,497 to 278,499
Planter, corn, F. J. Perkins 278,455
Plow, ditching, J. D. Hobbs 278,549
Plow landside, G. B. St. John 278,623
Plow, sulky, G. Wiard 278,643
Plow, wheel, D. R. Dodge 278,519
Plumber's trap, P. Connolly (r) 10,333
Pocket, R. Nicol, Jr 278,587
Pool apparatus, lawn, W. H. Kelly 278,341
Power. See Manual power. Mechanical power.
Press. See Baling press.
Privy sink, T. Keely 278,558
Pulley, Fulton & Olsen 278,425
Punch, sheet metal, F. W. Toedt 278,633
Puzzle, J. U. Mackenzie 278,571
Railing for cemetery plats, V. T. Meredith 278,579
Railway spike, W. Goldie 278,428
Railway switch, J. Gibbon 278,533
Railway switch, J. L. Hill 278,548
Railway switch, Leet & Isreal 278,344
Rake. See Hay rake.
Reflector and signal frame for car lamps, H. Roth 278,602
Reflector, lamp, H. F. W. Seele 278,610
Refrigerator, J. Castell 278,507
Regulator. See Electric machine regulator.
Ring. See Packing ring.
Rock drilling apparatus, G. M. Derby 278,517
Rolling axes, die for, L. Hammond 278,544
Rolling tubes, columns, etc., machine for, C. Kellogg 278,340
Roofing material, S. M. Allen 278,481
Saddle, harness, S. A. Marker 278,349
Sash balance, J. W. Lyons 278,348
Sash holder, S. Lear 278,439
Sash lifter and lock, automatic, C. W. Elliott 278,323
Scarf, F. O. McCleary 278,444
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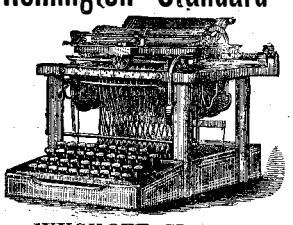

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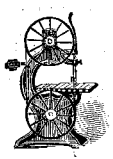

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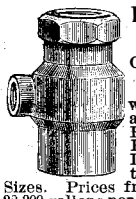

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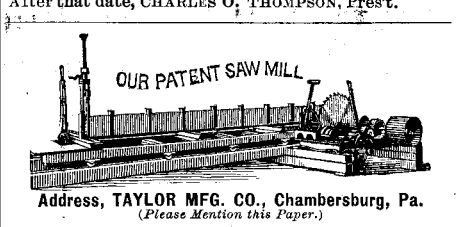

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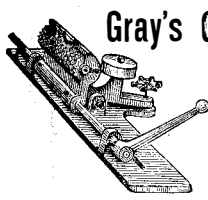

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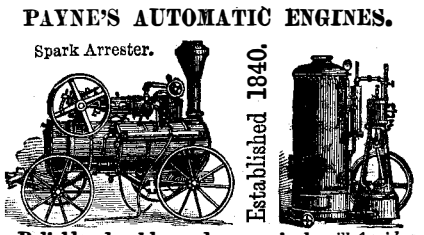

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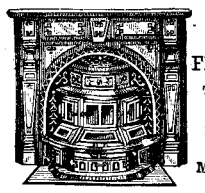

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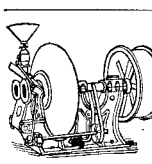

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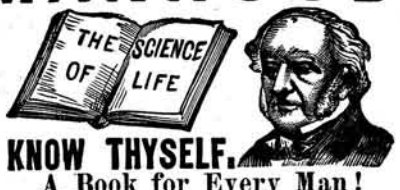

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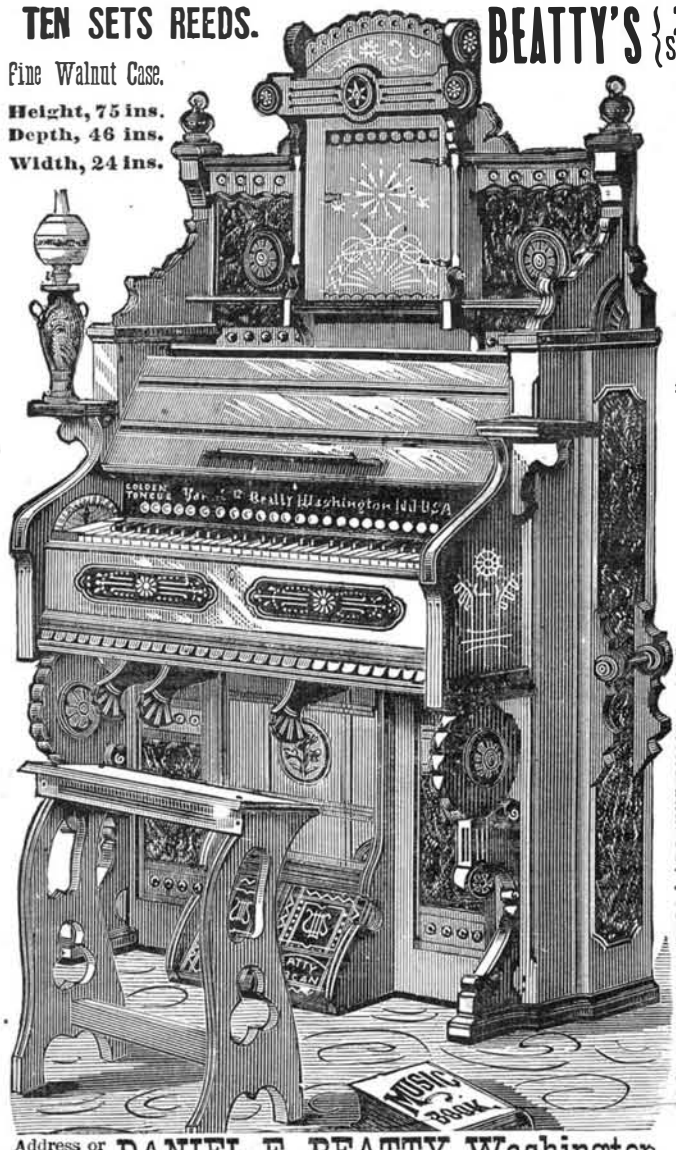

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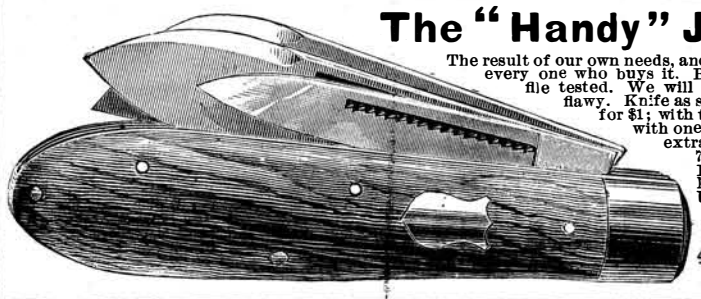

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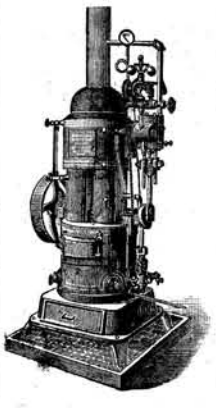

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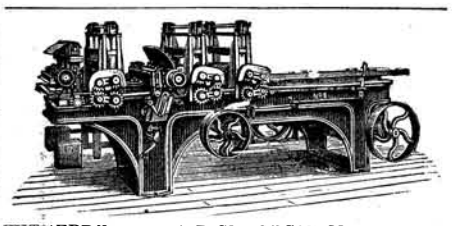

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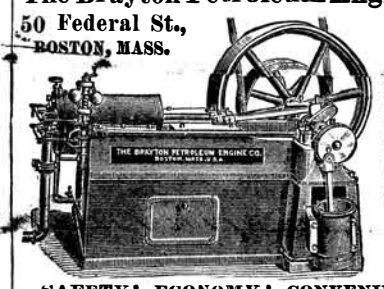

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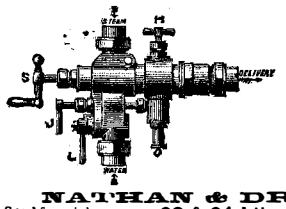

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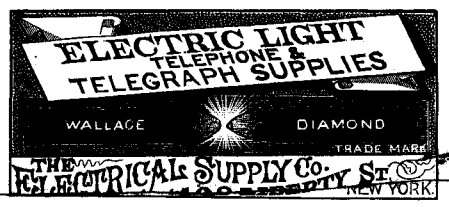

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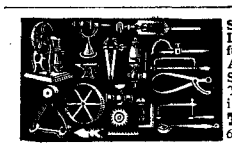

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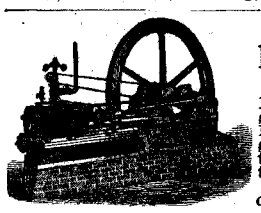

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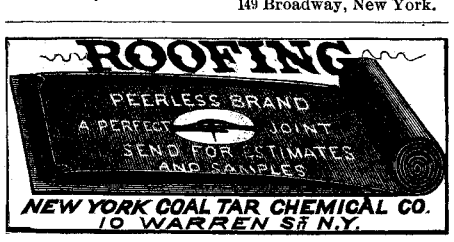

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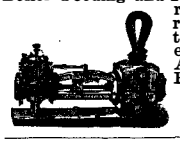

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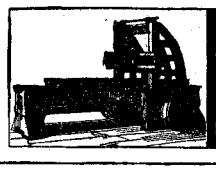

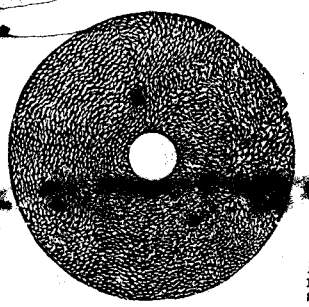

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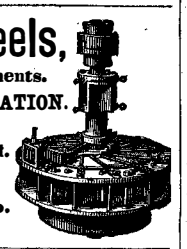

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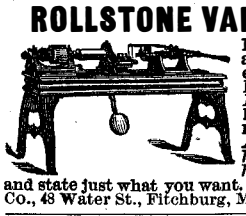

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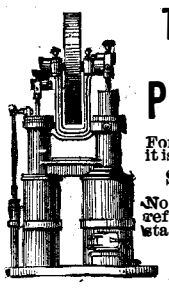

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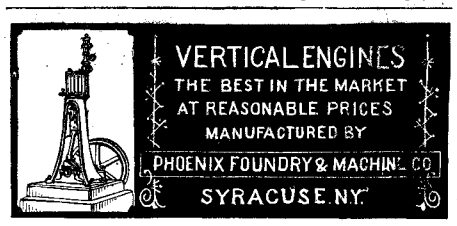

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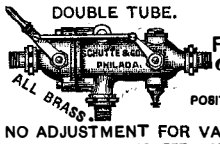

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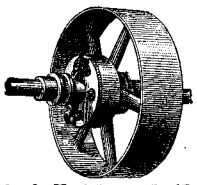

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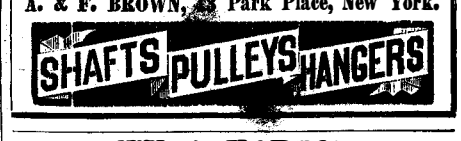

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